AUSTRALIA'S NUMBER ONE ELECTRONICS MAGAZINE

ELECTRONICS AUSTRALIA

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JULY 1983
AUST $2.10* NZ $2.60

TRACKING DOWN GHOSTS USING MAPS AND YOUR TV

SUPERTEXT: TV FOR THE DEAF

TACHO/DWELL METER FOR TUNE-UPS

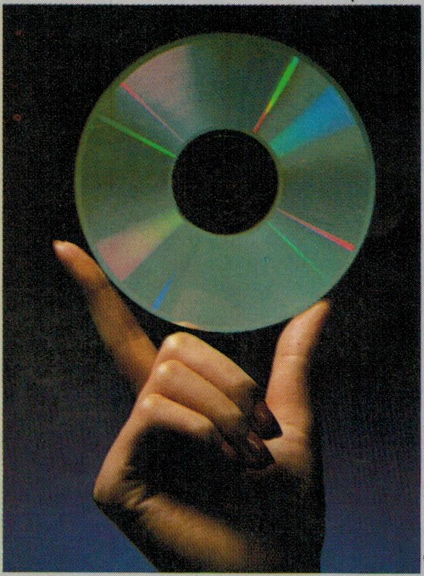
4½-DIGIT LCD EVENT COUNTER

UFOs: TIME FOR RATIONAL STUDY

SONY
THE ONE AND ONLY

The Sony CDP101
The magic of digital audio becomes a magnificent reality.

Digital Audio is a revolution. The greatest advance in home music reproduction since the gramophone record. As you'd expect, Sony is the leader of this revolution with its magnificent CDP-101 player that offers you original studio master quality at home.



For the technically minded, the specifications read more convincingly than any superlatives • flat frequency response over the entire audible range • dynamic range and signal to noise ratio over 90dB • perfect channel separation • immeasurable wow and flutter • negligible distortion.

Sony's CDP-101 uses an optical laser pick-up (incorporating three micro processors), it is easier to use than a conventional turntable and connects easily to your existing system.

Other features include • fully automatic linear skate front disc loading • automatic music sensor • dual function digital readout of playtime • audible fast forward and reverse • 10 function wireless remote control.

Compact Discs Last Forever

Just 12 cms in diameter, the Compact Disc plays up to 60 minutes of music. It's protected from scratches, dust and finger prints by a plastic coating; and because the pick-up is a laser beam, deterioration is non-existent. Reproduction remains perfect virtually forever.

Hundreds of titles will be available with many more to follow from major companies such as CBS.

CDP-101 Specifications

Frequency Range	5Hz-20kHz ± 0.5dB
Dynamic Range	more than 90dB
S/N	more than 90dB
Channel Separation	more than 90dB (at 1kHz)
Harmonic Distortion	less than 0.004% (at 1kHz)
Wow and Flutter	immeasurable

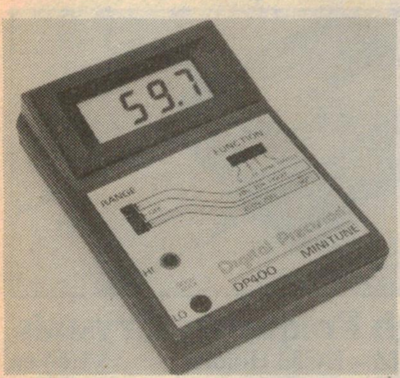
Contact Sony for the name of your nearest dealer.
Sydney (02) 266 0655, Adelaide and N.T. (08) 212 2877, Brisbane (07) 44 6554, Perth (09) 323 8686, Melbourne (03) 419 3133, Launceston (003) 44 3078, Wollongong (042) 71 5777.

AUD0378

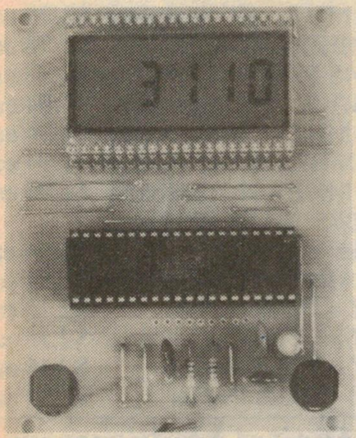
AUSTRALIA'S LARGEST SELLING ELECTRONICS MAGAZINE

ELECTRONICS AUSTRALIA

Volume 45, No. 7
July, 1983



This compact engine analyser will measure rpm, dwell, voltage and resistance, and can be used with both electronic and conventional ignition systems. Details page 54.



Featuring a 4½-digit LCD liquid crystal display, this general-purpose event counter is battery-powered and can count to 19,999. Find out how to build it on page 66.

On the cover

Ghosts don't normally lean on TV sets — they are more usually found on the screen. Find out how to track them down in our article starting on page 82. Also featured is the new TV caption service for deaf viewers now offered by major metropolitan broadcasters. Details on page 20.

FEATURES

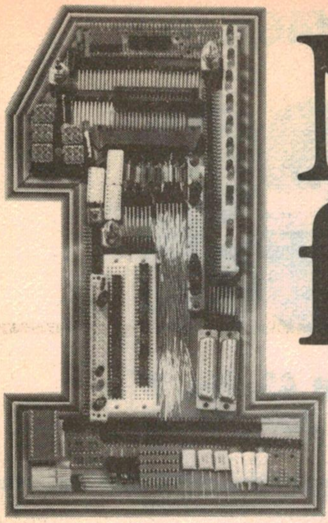
HIFI, VIDEO AND REVIEWS

PROJECTS AND CIRCUITS

PERSONAL COMPUTERS

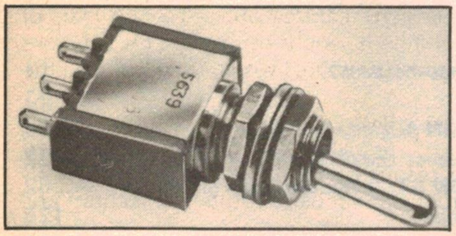
COLUMNS

DEPARTMENTS



No.1 for any bits.

"ASK ABOUT OTHER ITEMS ON SPECIAL"



Mini. Toggle Switches

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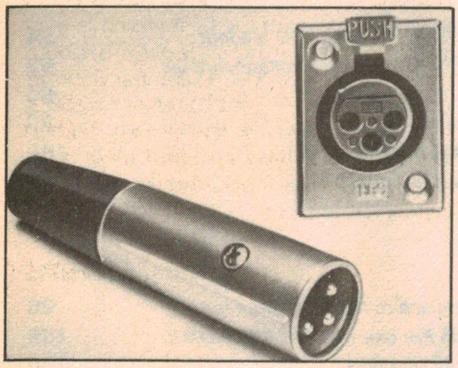
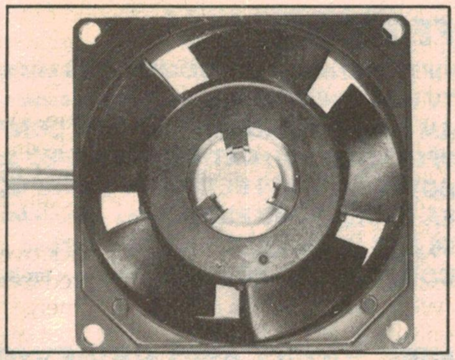
5644A 2 Pole on-on-on silver	$0.97 ea
5644CD 2 Pole on-on-on-gold	$1.16 ea
5646A Dble pole on-on-silver	$0.90 ea
5649CD 2 Pole on-off-on gold	$1.12 ea
5656A 3 Pole on-on silver	$1.50 ea
5659A 3 Pole on-off-on silver	$1.62 ea
5664A Dble pole dble throw	$2.08 ea



Hirose Audio Connectors

HA16JA3P – 3 Pin microphone plug	$1.41 ea
HA16PA3 – 3 Pin microphone socket	$1.87 ea
HA16PR3S – 3 Pin chassis female	$2.05 ea



Axial Flow Cooling Fans

240 Volt – 4"	$11.00 ea
240 Volt – 3"	$11.00 ea

Re-Chargeable Batteries

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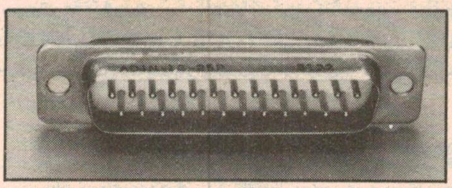
EP626 2.6AH Solid gel	$10.37 ea
EP1240 4AH Solid gel	$19.12 ea
EP1280 8AH Solid gel	$31.40 ea



D-Series Connectors

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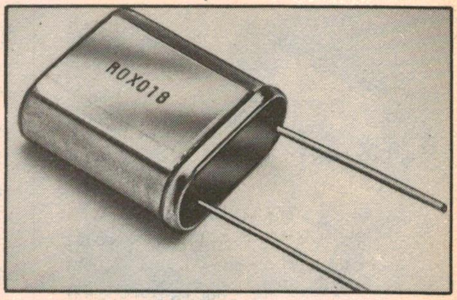
ADINIS25P – Solder cup	$1.92 ea
ADINIS50S – Solder cup	$5.73 ea
ADINIS50P – Solder cup	$3.95 ea
AD3S25S – 25 WY Wirewrap female	$6.10 ea
AD3525P – 25 WY Wirewrap male	$4.21 ea



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2.5 MHZ – HC33 Holder	$2.78 ea
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3.2768 MHZ – HC33 Holder	$2.78 ea
3.2768 MHZ – HC18 Holder	$2.78 ea
3.330 MHZ – HC18 Holder	$2.78 ea
3.579545 MHZ – HC18 Hder	$2.38 ea
4.440 MHZ – HC18 Holder	$1.94 ea
5.9904 MHZ – HC18 Holder	$1.94 ea
6.1444 MHZ – HC18 Holder	$1.94 ea
6.5536 MHZ – HC18 Holder	$1.94 ea
8.8672375 MHZ – HC18 Holder	$1.94 ea
9.8304 MHZ – HC18 Holder	$1.94 ea
10 MHZ – HC18 Holder	$2.16 ea
10.73865 MHZ – HC18 Hder	$2.16 ea
15 MHZ – HC18 Holder	$2.16 ea
18 MHZ – HC18 Holder	$2.38 ea

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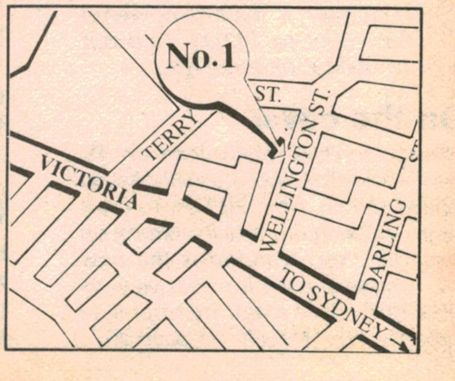
Buzzer and 10 AMP range $45.00 ea



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The absolute in peripheral thinking.

Editorial Viewpoint

And so, after forty-two years . . .

In the Christmas 1941 issue of this magazine, then called "Radio & Hobbies", an editorial by the current Editor, the late John Moyle, described the issue as "something of a landmark". It carried a selection of the designs featured during the 2½ years of the magazine's existence as a technical monthly; it would be his last issue before joining the RAAF as a Radio Officer; as from the next issue, I would be occupying the editorial chair.

It was certainly a landmark for me. While I had gained some experience as a technical writer, notably for the "Radiotron" publications of the Amalgamated Wireless Valve Company, instant and full responsibility for an evolving monthly magazine was quite a step – especially from the almost institutional security and conservatism of AWA in the '30s!

Now, 42 years later, I can look back over a period of service in the editorial chair exceeding, in total, that of all my predecessors on this magazine and on the historic "Wireless Weekly" from which it emerged. It's been a very enjoyable experience if only because, for all those years, I have been paid to work at my hobby! That's surely one of the fascinating things about wireless/radio/electronics: consistently, it has been so broad in its spectrum, so forward-looking, so on-going, that there is no problem at all about it providing, at the one time, a rewarding occupation and a fascinating hobby.

Now the time has come for me, in turn, to vacate the role of Editor-in-Chief and to leave the magazine in other hands. As you will doubtless already have assumed, responsibility for "Electronics Australia" will rest with Editor Leo Simpson, assisted by Greg Swain and an editorial team that, collectively, ranks with the best we have ever had. Despite the prevailing economic gloom, the future has never looked brighter.

I will probably be active for some time yet as an independent consultant and writer for this magazine, and for our associate journal "VideoMag" – but hopefully without the compulsion of an every-day commitment. I step down, with the very highest regard for those who will carry on into the next decade. What I shall miss most is the almost personal link with readers and advertisers who have supported the magazine through the ever-changing phases and fortunes of our industry – and our hobby. To you all: a very sincere thank you!

Neville Williams

Editorial and Advertising Office
57 Regent St, Chippendale 2008.
Phone (02) 699 3622 Telex 25027.
Postal Address: PO Box 163, Chippendale, 2008.
Advertising Sales Manager: Sel Sayers.

Melbourne — 392 Little Collins St, Melbourne 3000. Phone (03) 602 3033.
Representative: Mark Christian.

Adelaide — Charles F. Brown & Associates Ltd, 178 Fullarton Rd, Dulwich 5065
Representative: Sandy Shaw (08) 332 7711.

Perth — 454 Murray Street, Perth 6000.
Representative: Ashley Croft (09) 321 8217.

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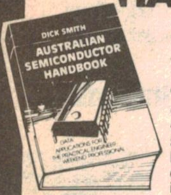

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We now stock the incredible new COMMODORE 64 Computer

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Landline Interface
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UNIQUE IN AUSTRALIA!

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$59.50

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Storage Cassette Unit
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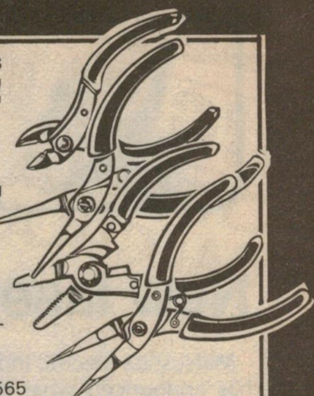

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6146B....Cat. D-7202 **$19.95**

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Calling all System 80 owners: isn't it a pain in the neck using the arrow keys to play games? Wouldn't you rather use a Joystick control?

Cat. K-3455

Here's your chance! This kit allows you to add a joystick to your System 80 via the printer port – and here's the good news: This month only we're GIVING A FREE 'QUICKSHOT' JOYSTICK with each Interface kit! That's right, save an amazing *$24.95* – this month only!

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Contour grip, rubber suction cups to hold it down during those tight movements. It's just like the real one in a helicopter. Suit VIC and Atari, or System 80 (see above).

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AMAZING VALUE

NOISE PROBLEM? BEAT IT WITH THESE SUPPRESSORS

Inline Distributor Suppressor
Connect anywhere in lead to eliminate or reduce distributor noise.
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A spark plug cap with inbuilt 50K resistor. Cat. A-7908 **$1.00**

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News Highlights

New laser disc can record and play back

Matsushita Electric Industrial Company has announced what is believed to be the first optical disc system on which stored information can be erased and re-written.

The successful development of an "erasable" system is likely to enhance the optical disc as an alternative medium to magnetic devices, such as the floppy disc for mass information storage, notably in office filing system applications.

In the long term it could also have important implications for the prospects of optical disc-based consumer products, which currently include the laser videodisc and the digital audio disc.

At present these discs cannot be re-recorded, and consequently suffer in competition with magnetic tape products which the user can re-program at will.

The 20 centimetre diameter Matsushita disc can store up to 15,000 colour still pictures or 100,000 A4 size documents, which is equivalent to 1000 times the capacity of a 20cm one megabyte floppy disc. Information on the disc can be erased and re-written up to a million times.

The optical disc used in the newly-developed erasable system employs tellurium suboxide, the same material used in conventional record and playback systems. With a small amount of germanium, indium, and lead added the structure of recording materials becomes reversible between both the crystalline phase and the amorphous (non-crystal) phase through irradiation with a laser beam.

In the recording process, the crystalline phase, which has high reflectivity, converts itself into the amorphous phase, of low reflectivity. The opposite occurs during the erasing process. For recording and playback, a laser beam of 0.83μm wavelength and 8mW incident power is irradiated, and for erasing, a 0.78μm wavelength 10mW laser is used.

By using a single focusing lens for the two lasers, almost simultaneous erasing and recording has been achieved. The single optical head system also allows a compact configuration of the optical mechanism unit.

Among the features of the new systems are:

- Erasable and replaceable memory function realised in an optical disc recording system for the first time.
- High signal to noise ratio due to great change in laser's reflectivities between recorded and erased areas. The characteristics of tellurium suboxide film are such that it can record even TV broadcast signals in real-time.
- A protective film layer which seals the recording material and protects the disc from dust and scratches.

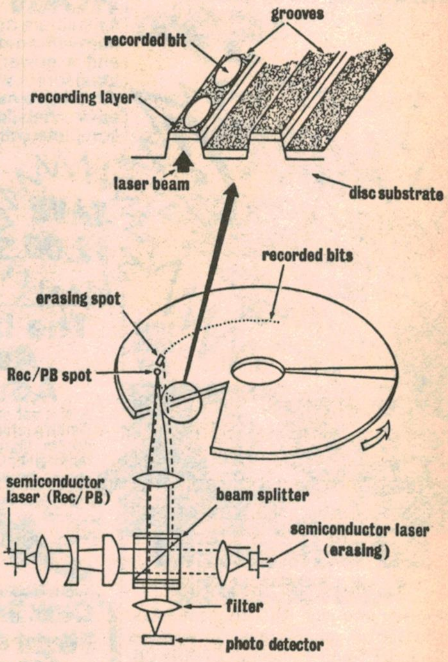


Diagram at top shows the disc surface with recording grooves while above is an exploded view of the two laser optical system.

Solar cell factory for South Australia

Science and Technology Minister Mr Barry Jones recently opened a photovoltaic solar cell manufacturing, demonstration, and testing facility at Hendon, SA.

The $1.1 million project was funded by the Public Interest section of the Industrial Research and Development Incentives Act, following recommendations from the National Energy Research Development Council in June 1981.

Philips Industries Holding Ltd were awarded the contract and built the facility at their microelectronics factory at Hendon. The facility researches process techniques for manufacturing solar cells and support systems, and assesses the commercial practicability of other public funded research which is continuing in this field. Telecom are already using solar powered radio telephones and microwave repeaters on the Nullabor Plain and in other remote areas of Australia.

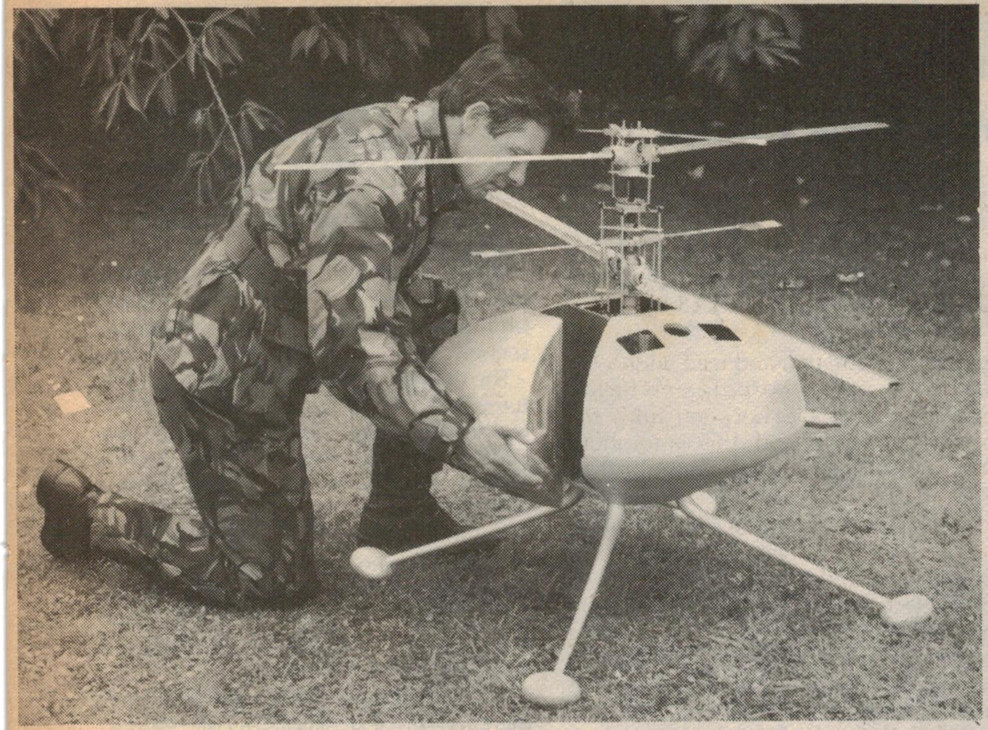
In photovoltaic panels, the individual silicon cells directly convert the sun's energy into electricity. The panels comprise 36, 100mm diameter cells laminated between two glass sheets. Each of these panels generates 33 watts of electricity and it would take two to four panels to operate simple lighting and low energy appliances in remote homesteads.

Electronic speech in a wristwatch

Seiko has announced a new digital wristwatch capable of recording and reproducing voices.

Seiko's "TV wristwatch" which was put on sale in Tokyo and Osaka at a price of around Y100,000 ($A490) has sold sufficiently well for the company to start nationwide distribution from May, and exports to the US are to begin in September.

The latest watch, called the "Seiko Voice Note" allows recording of up to eight seconds of sound by means of a small speaker-microphone and two 16 kilobit RAM chips. The company says a larger capacity version of this tapeless recording system is to be developed in the future. A spokesman suggested that purchases of the "Voice Note" might use its sound recording function for the storage of simple messages, appointment reminders and so on.



THIS MINIATURE HELICOPTER is not a toy, but a practical military and civilian device. Called the Sprite, it is manufactured by the ML Aviation Company Ltd, of Berkshire, England. It has been designed as a highly manoeuvrable but stable aircraft controlled by radio command signals and has been constructed for both military and civilian purposes.

Two people are required at the control station to operate the Sprite. The whole system may be carried in a fairly small vehicle in which it is readily concealed. The Sprite can operate vertically without the need for specialised take off and retrieval systems and, although it is intended that it will survive enemy counter measures, it is cheap enough to expend when necessary.

The basic Sprite sensor pack module contains a stabilised television camera with a zoom lens, but it can carry a number of quickly changeable payload packs to render the equipment suitable for a wide range of operations. The alternative payloads currently available are low light television equipment, infrared imaging equipment, a laser target designaıor, chemical sensor systems, electronic intelligence equipment, electronic counter measure systems, a searchlight and a loudhailer.

Telescope to track geostationary satellites

An RCA television camera tube which can operate at very low light levels is helping the US Air Force to pinpoint, track and identify man-made satellites up to 35,000km away. The device, called a silicon-intensifier target camera tube, is a key part of one of the most advanced and sensitive astronomical systems ever developed.

RCA's tube serves as the eye of a special camera of the Ground-based Electro-Optical Deep Space Surveillance System (GEODSS) which is in operation at observatories on the White Sands Missile Range, New Mexico; Taegy, Korea; and Maui, Hawaii. The Air Force plans two other similar space tracking stations around the world.

With the GEODSS system, objects the size of a soccer ball can be spotted at a distance of 35,000km.

The Air Force system employs two 100cm aperture telescopes for deep space tracking and a 38cm instrument for scanning lower altitudes. Each telescope is coupled to a TV camera containing RCA's low light level SIT camera tube. The telescopes are able to see objects 10,000 times dimmer than those visible to the human eye.

Electronic sightings and identification utilising the GEODSS system are almost instantaneous. Pictures from the TV cameras are converted into digital pulses and fed into a computer. The computer software examines the digital data to sort out stars from moving objects. The software also contains a catalogue of known stars and orbiting satellites which is used for identification purposes.

Third GOES weather satellite in orbit

The Hughes Aircraft Company recently launched the third in a series of environmental satellites, the GOES-F, to monitor and report on world weather conditions. GOES-F will be operated by America's National Oceanic and Atmospheric Administration, monitoring weather patterns across the USA and Pacific Ocean. It joins Japan's GMS and Europe's Meteosat as the third geostationary weather satellite forming the World Weather Watch Project. All three satellites were built by Hughes.

At the heart of the GOES-F satellite is an instrument called Vas which senses the radiant energy produced by the earth and clouds and sends back pictures every half hour. The weather profile is then processed by ground stations for inclusion in press and TV weather reports.

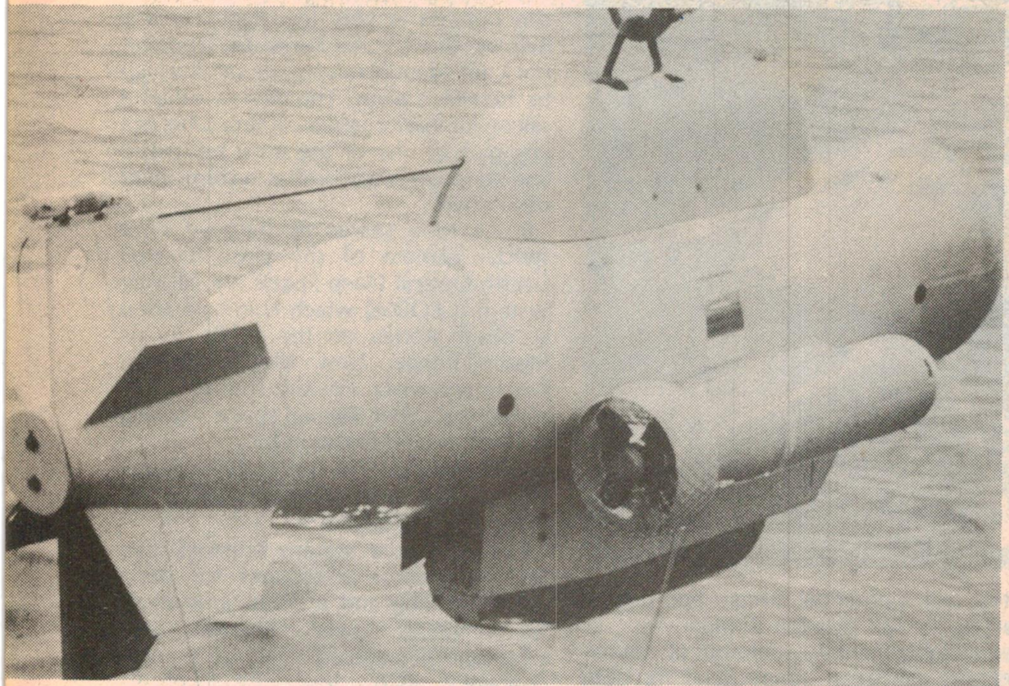
Weighing nearly half a tonne, GOES-F also carries a data collection system which regularly receives information from ground instruments such as rain and river gauges, seismometers, buoys and automatic weather stations. The information is of particular benefit to agriculture, shipping, fishing, water and power distribution management activities.

The satellite was launched from Cape Kennedy on a McDonnell Douglas Delta rocket and will remain fixed in geostationary orbit 35,890km over the equator.

Meanwhile President Reagan is currently studying a report which recommends that the United States' weather satellites and Landsat network be sold off to private enterprise. Main contender for the purchase would be the US company Comsat.

NEWS HIGHLIGHTS

Remote control submarine mine hunter



This remote control submarine will be carried on board the inshore minehunter ships being built in Australia for the RAN. The submersible, called the PAP104, is manufactured by a French company, Societe ECA, while the minehunters, based on a catamaran hull design, will be built by Carrington Slipways Pty Ltd of Tomago, NSW.

Announcing the award of the $3.6 million contract to build the submersibles, the Minister for Defence, Mr Gordon Scholes, stated: "The inshore minehunter is an innovative and unique Australian Defence design. The construction method is also unique in that the ship's hulls are to be constructed from a foam plastic sandwich encased in fibreglass." A feature of the minehunter design is the catamaran style twin hull.

When a mine is detected by sensitive sonar on board the minehunter the submarine will be placed in the water and guided by remote control to fix an explosive charge to the mine. Once the submersible retires to a safe distance the charge is detonated, disposing of the mine. A television camera on board the submarine lets the operator know what's happening.

Mr Scholes said that the selection of the French manufacturer followed advice from the officers of his department. No tenders were received from Australian companies "because of the highly specialised nature of the system and the small quantities required," he said.

Avtek Electronics opens in York Street

Sydney's "Silicon Alley" in York St, just up from the Town Hall, has received another boost with the opening of Avtek Electronics by Phil Gleeson.

Phil is well known to Sydney electronic hobbyists. He worked for Dick Smith Electronics for over six years and later joined Applied Technology and became involved in the Microbee project. Most recently he was one of the key men at Jaycar before he decided to "go it alone".

Phil believes that the growing interest in electronics has created a need for the kind of service he will be offering. Avtek aims to carry the largest range of "over the counter" semiconductors available, in addition to a wide range of chassis and printed circuit hardware.

Avtek will also be a major outlet in Sydney for Altronics Distributors of Perth.

Avtek will be open for business from 9am to 5.30pm Monday to Friday (to 7.30pm on Thursday nights) and on Saturdays from 9am until noon. The address is 119 York Street, Sydney ("directly above Charlie Browns wine bar" says Phil). The phone number is (02) 29 8777.

IREECON '83 exhibition and lecture program

The Institution of Radio and Electronic Engineers Australia will be holding the annual IREECON exhibition and seminar conference in Sydney from Monday 5th to Friday 9th of September at the Sydney Showground.

Over 100 companies will be exhibiting, including some of the best-known names on the local and international electronic scenes.

The theme of the exhibition and lecture program will be "World Communications Year", in keeping with the United Nations resolution to devote 1983 to stressing the importance of communications.

Around 300 papers will be presented at the Convention, covering a wide cross-section of topics in the electronics field. A feature of the Exhibition will be a special display of equipment designed and developed in Australia.

At the time of writing registration for the conference is still open. For information contact the IREE, 3rd Floor, 35 Clarence St, Sydney, NSW, 2000.

IBM sues ex-employees to protect secrets

The IBM industrial espionage case against Hitachi and Mitsubishi, reported in our April issue, may well be drawing to a close, but IBM are still decidedly twitchy about the whole subject of industrial espionage.

Their latest attack is on a quite different, and rather more nebulous basis; whether former employees have the right to use the knowledge gained while in IBM's employ to set out their own organisation in opposition.

Five former IBM employees formed a new company, Cybernex, in 1981 and IBM is now sueing them, claiming that they based the company on a knowledge of IBM techniques which they learned while with IBM.

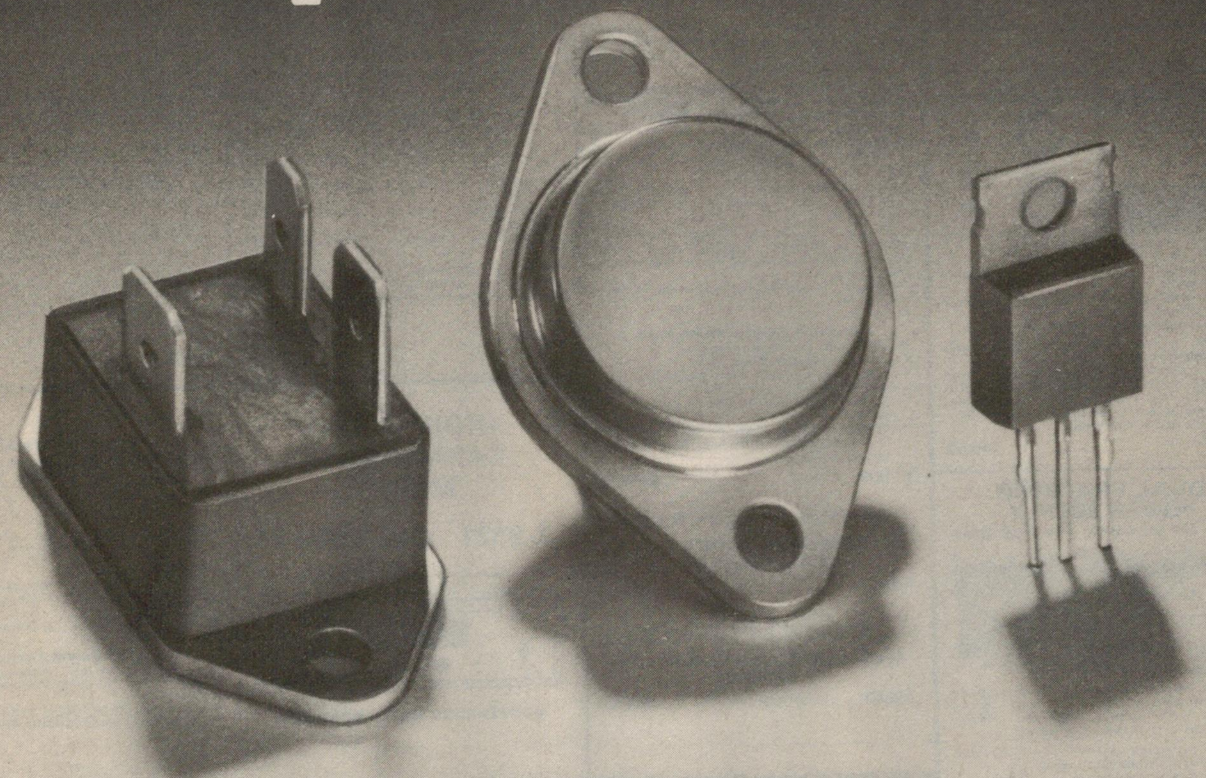
The Cybernex team deny that they have broken the law, and the whole argument seems to boil down to the difference between information obtained via stolen documents or hardware, and information which engineers and technicians learn while on the job.

Many companies protect themselves in this situation by specifying in the contract of employment that an engineer is not to set up in an opposing business on departure, but in some cases in the United States such contracts have been held to be an illegal restraint.

Because the IBM action has become something of a test case, the rest of the US computer industry – along with other manufacturers – is watching with considerable interest.

Make the Switch to GTO + Power MOS

Philips Powerful Partners



Now the choice in power semi-conductors for switching applications is easy with Philips complementary range of GTOs (gate turn off switches) and MOS FETS known as Power MOS. Together they cover the complete spectrum of power switching applications up to 1500 Volts and 50 Amps.

GTOs will be used mainly for higher voltage applications. Like the thyristor, GTOs can be turned on by positive gate drive and like high voltage transistors, can be turned off by negative gate drive...the best of both worlds.

The new Power MOS transistors are electrically and thermally very rugged, while their construction intrinsically means very fast turn-on and turn-off times...typically 100ns.

Other Power MOS features include:

- Direct drive from TTL/LSI plus μC output ports.
- Optimum reliability via outstanding SOAR characteristics.
- Easy parallel operation.
- High power amplification.

We can help you make the perfect switch. Simply contact your local Philips Components office for further detailed information on GTOs and Power MOS.

Call **Sydney** 427 0888,
Melbourne 542 3333,
Brisbane 44 0191,
Adelaide 243 0155,
Perth 277 4199.

PHILIPS Electronic Components and Materials

PHILIPS

ALTRONICS KITS COST MORE [Around $1 more]

REASONS ★ PREMIUM COMPONENTS USED eg. MOTOROLA, FAIRCHILD etc. ★ QUALITY INSTRUMENT CASES SUPPLIED WHERE INDICATED ★ EVERY LAST NUT AND BOLT SUPPLIED, EVEN SOLDER ★ IC SOCKETS SUPPLIED WHERE INDICATED.

Your finished product will look so good your friends won't believe you built it.

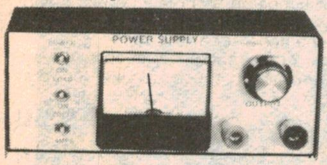
ALTRONICS • BANKCARD JETSERVICE DELIVERY NEXT DAY • ALTRONICS

OUR BEST SELLING POWER SUPPLY KIT EVER

3–32 volt output at 1 amp UNDER $40

THE ALTRONICS POWER SUPPLY

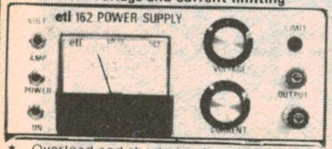
Based on EA LM 317K Project
Every workshop, school and hobbyist should get one now ! ! !



- ★ Fully projected from thermal runaway and short circuits.
- ★ Voltage and current metering.
- ★ To—3 regulator plus powerfin heatsink.
- ★ Fully documented, every last part included.

K3200 . . . . **$42.50**

1.3 – 30V @ 1 Amp
With voltage and current limiting



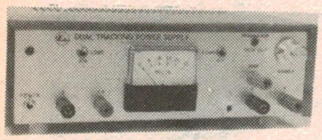
- ★ Overload and short circuit protected.
- ★ Voltage and current metering.
- ★ Regulation — better than 0.2% zero to full load
- ★ Hum and noise on output — less than 1MV at full load.
- ★ LED indication of current limit.

Exclusive — fully S.E.C. Certified Mains Transformer supplied.
If you're considering buying this kit from your local supplier or one of our competitors — first ring and ask them if the mains transformer is S.E.C. certified to ASC126 — chances are that it won't be.

K3205. . . . . **$49.50**

DUAL TRACKING POWER SUPPLY

± 1.3 to ± 22V @ 2 AMPS : + 5V @ 0.9 AMPS

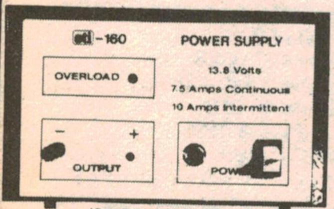


The ideal power supply for the audiophile experimenting with linear OP amp designs in which split supply operation ensures improved distortion and noise figures.

- ★ Fully protected against short circuits, overloads and thermal runaway.
- ★ LED indicator for regulator dropout.
- ★ Floating ground.
- ★ Uses 0.25% linearity 10 turn pot — tracks within 1MV.
- ★ Voltage adjustable to within 10MV.

K3220. . (EA MARCH 1982) . . **$86.00**

13.8V HIGH CURRENT SUPPLY



(See ETI JULY 1982)

- ★ Output voltage — 13.8 Vdc.
- ★ Output current — 7.5A continuous 10A intermittent
- ★ Regulation — 0 to 7.5A : 50MV

Save the expense of a mains powered rig. Kit complete in every way.

K3250. . . . . **$84.00**

DIGITAL FREQUENCY METER

7 Digit Resolution, measures period and frequencies to ★ 500 MHz

Professional unit — cost a fraction of similar built-up units.

This project is "so easy to construct", virtually all components mount on one single PCB, ensuring success even for the "not so experienced" constructor.

Use of the latest LSI circuitry ensures impeccable performance from the completed unit. This is further ensured by our use of top grade components.

NOTE: (Altronics use only the specified intersil LSi — beware of inferior kits that do not conform to the original design.

Frequency measurement to 500mHz (with optional Prescaler) in 3 ranges — 0—10MHz, 0—50MHz, 10—500MHz ★ 4 gating times — 0.01, 0.1, 1, 10 seconds.

Period measurement for accurate low frequency counts, 4 ranges — 1, 10, 100, 1000 input cycles ★ resolution 0.1us.

High Input Sensitivity — 10MV to 30MHz. 100MV at 50MHz @ 1MOHM Input impedance, 200MV @ 500MHz @ 75 OHMS input impedance.

Accuracy — typically better than 0.005% uncalibrated.

Exclusive Altronic Kit Features

- ★ IC sockets provided throughout
- ★ low aging 10.000 MHz XTAL.
- ★ Genuine Fairchild High Brightness FND 507 display's.
- ★ Quality ABS plastic case — deluxe front panel.
- ★ Complete kit as specified by EA includes instructions, all cables and every last nut, bolt and washer.

K2500 . . . . **$119.50**

DECIMAL POINT FOR K2500

READ FREQUENCY DIRECTLY IN MHz and PERIOD IN US.

K2502 . . . .**$7.50**

PRESCALER FOR K2500

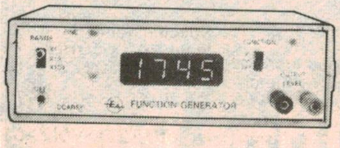
ALLOWS FREQUENCY MEASUREMENT TO 500MHz

K2501. . . (essential option) . . . **$26.00**

FUNCTION GENERATOR

(with digital display)

Sine, triangle and squarewaves : 15Hz – 250KHz.



The most essential piece of test gear (second only to a good multimeter) on any hobbyist's bench is some kind of audio signal generator. This design utilizes the latest circuit techniques to produce stable, low distortion waveforms.

A truly versatile unit at a bargain price.

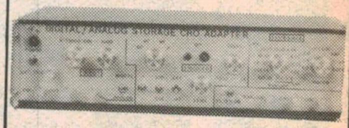
- ★ 4 digit frequency readout (eliminates tiresome dial calibration) —typical accuracy ± 2%.
- ★ 3 overlapping ranges ×1, ×10, ×100.
- ★ 600 OHM Nominal Output — continuously variable 3MV—2.5V P—P.
- ★ Distortion — sinewave : less than 0.7% @ 1KHz.
- ★ Linearity — triangle wave : better than 1% @ 1KHz.
- ★ Squarewave rise time — 6V/uz maximum output.
- ★ Amplitude stability — better than 0.1dB on all ranges.

With the exception of the display all components mount on a single PCB making this kit suitable for all constructors.

K2505. . . . . **$85.00**

ANALOG / DIGITAL STORAGE CRO ADAPTER

(See EA Nov 1980 and March 1981).



Unit enables indefinite storage of non repetitive waveforms at a fraction of the cost of conventional storage CRO's. National semiconductors A—D/D—A conversion techniques allow analog signals up to 100KHz to be stored ★ two channels while in digital mode ★ positive and negative edge triggering ★ AC/DC/HF and LF rejection ★ timebase tracer for accurate frequency measurement ★ accurate down to 1.9Hz Analog mode — 1us Digital Mode ★ delayed trigger 10us-1s ★ sensitivity — 160MV P—P @ 1 MEG (Analog)★ standard TTL and CMOS levels 3-15 volt supply (Digital).

The features of tnis unit are to numerous to list, yet is simple to operate.

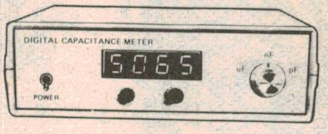
Be assured of quality with an Altronics Kit.

1. Genuine National A—D conversion chips not second sourced dropouts.
2. All IC sockets provided (27 total — you pay no more)
3. Low capacitance coax and a full metre of rainbow cable.
4. Full instructions and every last nut, bolt and washer.
5. Deluxe mini rack cabinet.

K2600 . . . . **$189.00**

DIGITAL LED CAPACITANCE METER

K 2521 . ONLY $55.00



with Deluxe Instrument Case

NEW DELUXE FINISH

We are pleased to announce the release of the Digital Capacitance Kit housed in our Deluxe H 0480 ABS Insrument Case.

This superb Test Instrument Kit now compliments our top selling Digital Frequency Counter and Function Generator Project Kit.

Electronics Australia Project. Measures capacitance of both polarized and non-polarized capacitors from 1 picofarad to 99.99 microfarads in 3 ranges.

Check values of unmarked capacitors, especially those little trimmers that are never coded.

Select precise values for filters and timing networks within ease.

★ ★ ★ EXCLUSIVE TO ALTRONICS ★ ★ ★

Each kit includes precision measured capacitors for accurate calibration of each range.

STANDARD VERSION K 2520
(in metal case) Same Specifications. . **$49.50**

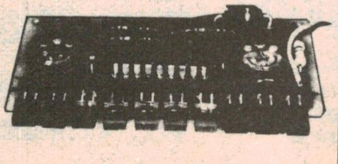
TRANSISTOR TESTER

Electronics Australia Project. Tests Bipolar Transistors, Diodes, Fets, SCR's and PUT's. Excellent service aid for the hobbyist and serviceman. Complete kit and instructions.

K 2525. . . . . **$19.75**

EXPANDED SCALE LED VOLTMETER

HAS MANY APPLICATIONS



ETI design suitable for lead-acid wet cells, lead acid gel electrolyte, vented nickel cadmium types and so on and so on.

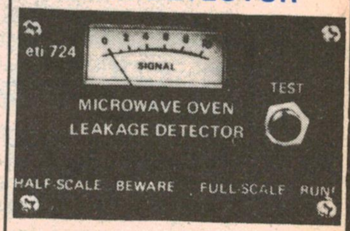
Unit covers range of 10.5v to 15v.

Determine battery condition instantly

Easy to Build!

K 4326. . . . . **$9.50**

MICROWAVE OVEN LEAK DETECTOR



ETI PROJECT

Completely passive project receives microwaves via an antenna which develops a voltage across a detector diode driving the meter.

Monitor your microwave oven with this easy to build kit. All components mount on single PCB, including the meter.

Genuine Hewlett Packard Hot Carrier Diode supplied.

K1724. . . . . (still only) **$14.50**

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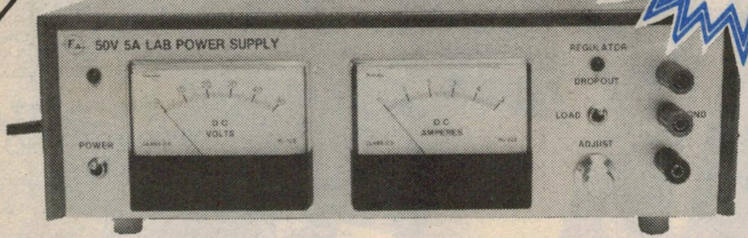
FREE DELIVERY ANYWHERE IN AUSTRALIA FOR THIS KIT! JULY ONLY

EA's BRILLIANT LABORATORY POWER SUPPLY

2-50V DC at a massive 175W



See Ea May and June 1983

Over the last 2 or 3 years we have had literally dozens of requests for a universal 5 amp Bench Power Supply Kit. Naturally we passed this on to the design team at Electronics Australia **and at last** it is now a reality. Just look at the design concept! A fully mains transformer isolated supply with a very clever "Switch Mode" low voltage circuit.
Most Importantly it's dead easy to build (ours worked first time!).

Specifications
Input 240V 50Hz
Output Variable 2 – 50V at up to 5 amps

K3300.................. **$139.50**

10 TURN VOLTAGE CONTROL OPTION

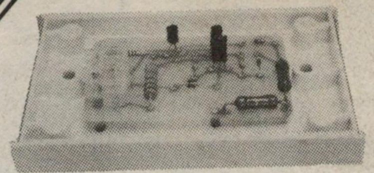
K3301..........(ONLY)... **$10.00**

HANDY + / – 12 V OPTION (SEE EA JULY 1982)

K3302..................... **$12.50**

WHY PAY OVER $250 FOR AN INFERIOR COMMERCIAL UNIT?

NEW



TOUCH LAMP DIMMER

HALF THE COST OF COMMERCIAL UNITS

Great new kit from EA. (April '83). Based on new Seimens IC S576A Light Dimmer IC.
Instantly turn lamps on and off with just a light touch on a wall panel, or provide mood lighting by touching the panel for a few seconds.
The Altronics Kit is complete in every way, including satin silver touch plates for that prestigous look.

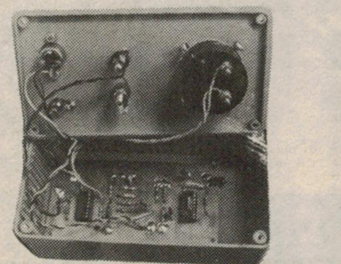
K6320 .... **$19.50**

REMOTE CONTROL FOR K6320

This kit enables extra dimmer/switches to be installed in conjunction with the Dimmer Kit. Includes satin silver touch plate.

K6321............... **ONLY $9.00**

NEW



RADIOTELETYPE-COMPUTER DECODER

DESIGNED FOR THE MICROBEE

(SEE ETI APRIL '83)

Display RTTY encoded messages on your VIDEO Monitor.
Simple circuit uses PLL TECHNIQUES, most components mount on a single PLB simplifying construction. Complete Kit includes D15 Plug for connection to Microbee IN/OUT PORT.

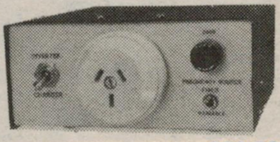
....

GO ANYWHERE 240V PWR. KITS

See EA May and June 82. These great new inverter kits enable you to power 240V appliances for your car, caravan or boat. (From Standard 12V car battery.)

40 WATT

Suits small appliances, i.e. turntable, tape deck, shaver etc. Variable frequency adjustment enables accurate speed control of turntable motors.



IC Sockets Provided

K6700 .... **$55.00**

300 WATT

Fully regulated and overload protected XTAL locked frequency.

* * * * * *

NOW USING HIGH EFFICIENCY TRANSFORMER

* * * * * *

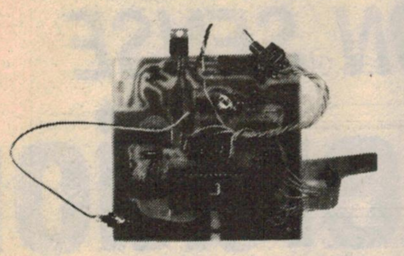
Use to power hi-fi, TV sets and for emergency lighting.

- Gold plating on both PCB edge and edge connector.
- Low age rate parallel resonant XTAL used.
- Sockets for all IC's.

K6750............... **$199.50**

$10 DELIVERY ANYWHERE IN AUSTRALIA!

'MICROBEE' EPROM PROGRAMMER



VERSATILE, LOW COST & EASY TO BUILD
Great new project from ETI (Jan. 1983). All components mount on a single printed circuit board. Unit simply plugs into the Microbee I/0 port. Suitable for 2716, 2732, 2532, 2732A and 2764's. Burn your games programmes and eliminate cassette loading times ★ Zero insertion force IC socket for eproms ★ Sockets for all other IC ★ 1 x 2716 supplied — get started straight away. ★ Kit supplied in deluxe jiffy box, all mounting hardware included

K9668 **$48.50**

VIDEO RF MODULATOR

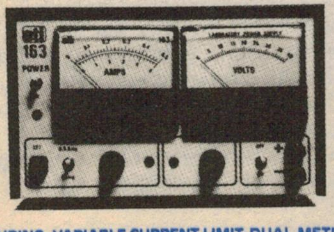
(SEE ETI OCT. 1981)

If you cannot afford a Video Monitor for your computer this is the kit for you. Super stable oscillator design and very low modulation distortion ★ Works with both B & W and Colour TV sets ★ Suitable for computers, TV games, TV pattern generators or what have you. Deluxe kit featuring heavy duty diecast box for RF shielding ★ Input and output sockets.

K9760 **$17.50**

LABORATORY POWER SUPPLY 0-40 VOLT/5 AMP

(SEE ETI MAY & JUNE 1983)



FEATURING: VARIABLE CURRENT LIMIT-DUAL METERING

A Laboratory Supply requires specifications second to none!

Output voltage	0-40 V, variable
Output current	0-0.5 A, variable limiting
	0-5 A, variable limiting
Output regulation	<50 mV at up to 2.5 A
	<100 mV up to 5 A
Maximum output power	200 watts
Metering Voltage	0-40 V in 1 V divisions
Current	0-0.5 A in 20 mA divisions
	0-5 A in 200 mA divisions

Series regulator design enables design and development of sensitive high gain audio and RF circuitry free from hum and noise sometimes associated with other techniques.

K3325.................. **$175.00**

All Altronics prices include Sales Tax. Don't be conned by other advertisers whose seemingly low prices are "plus Tax in fine print". You could well pay up to 32½% more.

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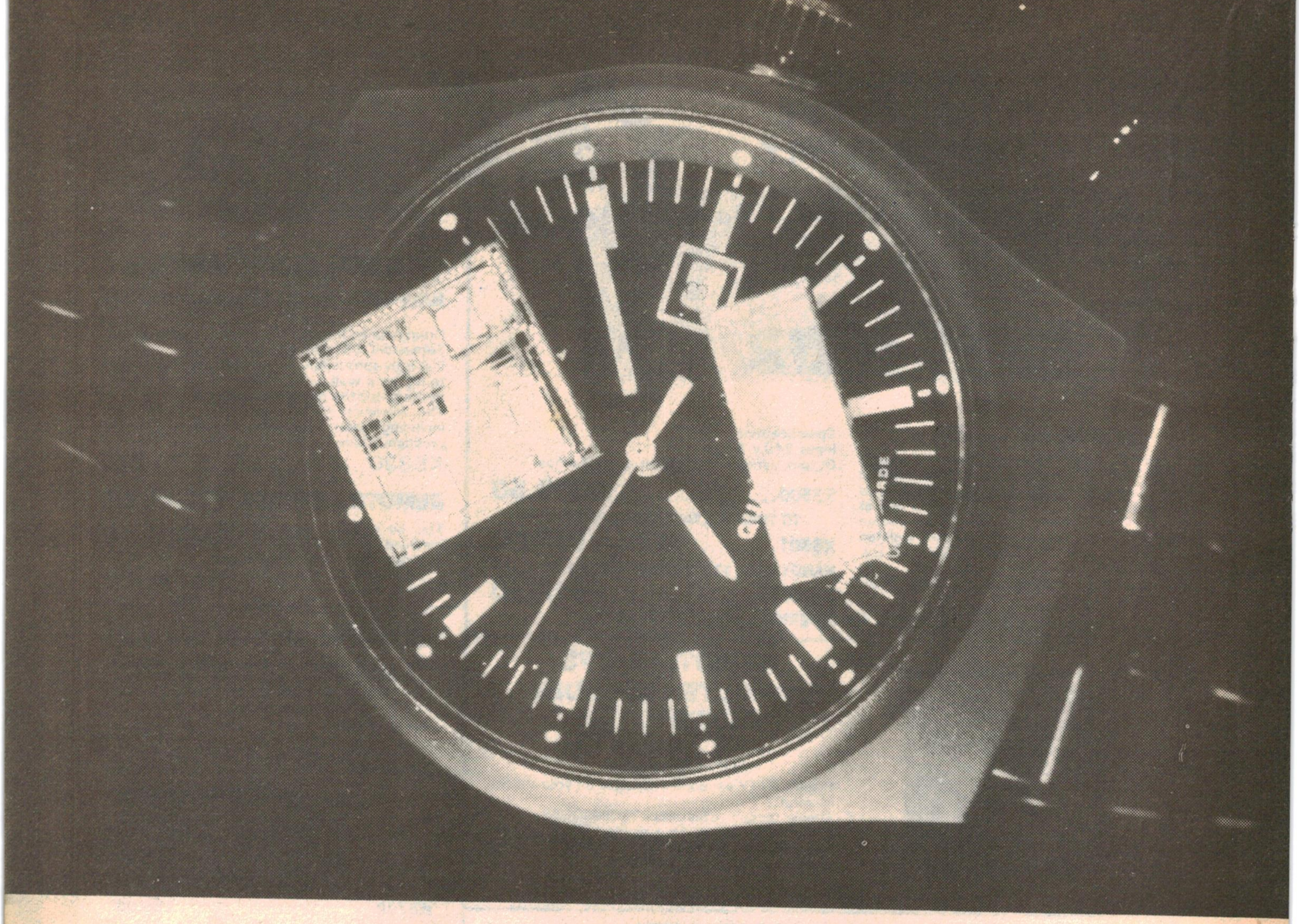


MACHINES WITH COMMON SENSE

Fifth-generation

Hardware that can see, listen, talk, learn, and make judgements is

HOZUMI TANAKA turned to his computer terminal and typed an English sentence: "I have some eggs in my hands."

Seconds later, the sentence scrolled across the screen in katakana, the Japanese characters that are so bewildering to Westerners. The demonstration was the result of three years of effort for Tanaka at the advanced Electro-Technical Laboratory (ETL), about 110km from Tokyo.

His language-translator program easily shifted between Japanese and English, forming perfect sentences in either language at the touch of a button. Still, given the bewildering array of grammatical rules that had to be defined for the computer by Tanaka and his small team of software specialists, the machine's English vocabulary had reached only 100 words.

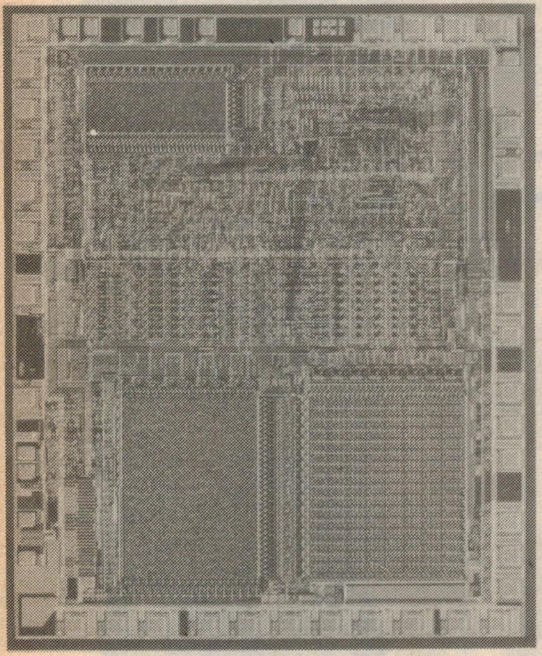
"We've proved the concept," Tanaka told me. "Now we can start on the big program, a language translator for routine use." That program, still three to five years away, will be delivered to another lab in Tokyo to simplify communication between an extraordinary new type of computer – the so-called fifth-generation computer – and its eventual users.

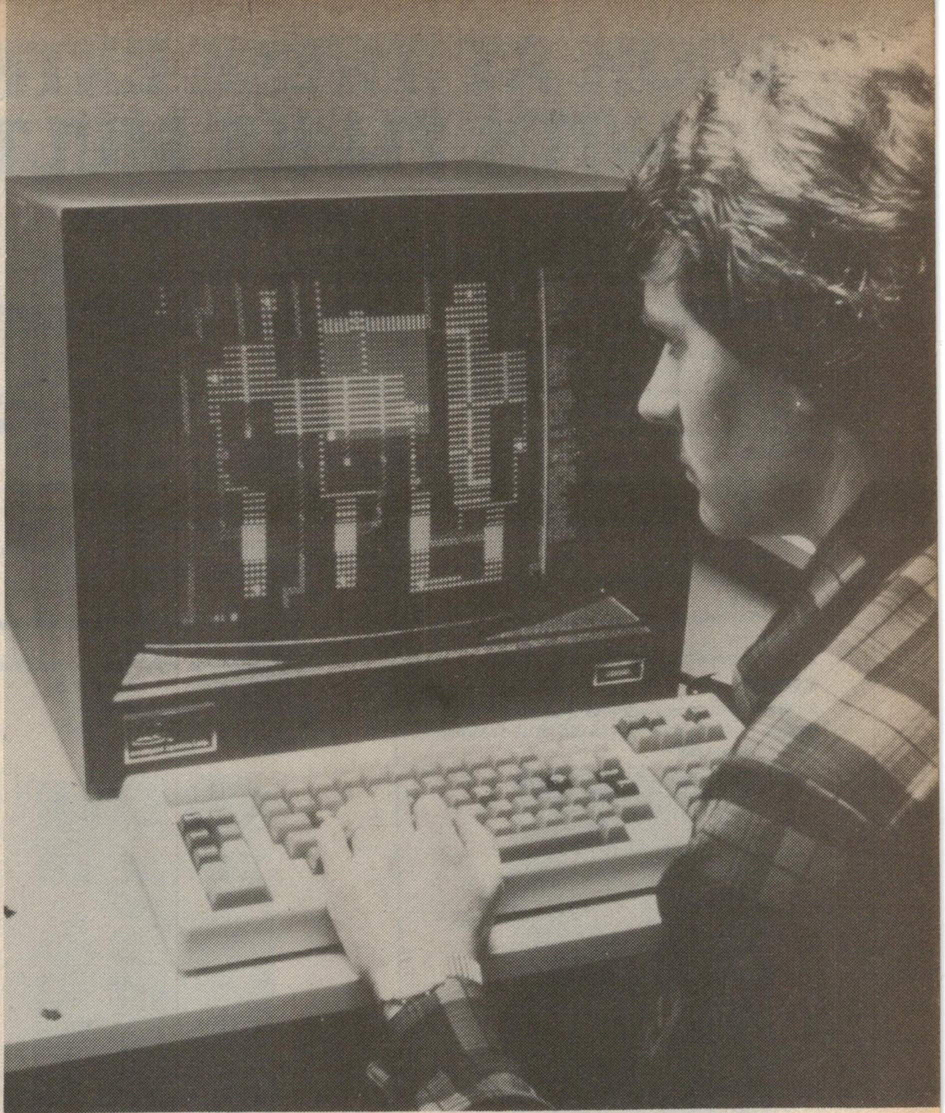
At the lab, a team of elite designers is already studying computer circuits unlike any ever seen. Other teams are tackling new forms of complex software intended to revolutionise computer technology.

After its overwhelming success in the automobile and consumer-electronics markets, Japan is beginning to build a computer so advanced that its development ranks as a national project. This fifth-generation computer is to be perfected and turned over to private industry by 1992.

If it works, the machine will incorporate artificial-intelligence (AI) concepts and rival the fictional HAL of "2001". Japan's fifth-generation computer will:

Shrinking the dimensions of circuit components lets engineers put entire systems on one silicon chip. At left, the square chip is Bell Laboratories 32-bit microprocessor with 150,000 transistors. The rectangular array below it is a 256-kilobit memory with 600,000 transistors. Photo below shows American Microsystems Inc. 16-bit microprocessor chip, itself designed with the aid of a colour graphics computer display of mask patterns which determine the shapes and interconnections of silicon areas left after etching. Photo at right shows a terminal in use by an AMI engineer.





by JIM SCHEFTER

computers

the goal for the early 1990s.

- Listen when you talk, then do what it's told.
- Help program itself.
- Sort through volumes of facts to find and use only what's pertinent.
- Make logical inferences.
- Translate foreign languages.
- Treat images and graphics the same as words ("see" and "understand" a photo, for example).
- Learn from its own experience.
- Come in both portable and fixed-base systems.

The fifth-generation computer will use advanced forms of very-large-scale-integration (VLSI) chips – semiconductor chips that have higher component densities and are capable of much higher speeds than those available today. The Japanese machine will have new forms of computer architecture: Instead of one central processor – the "brain" of a computer – or even several processors working simultaneously in parallel, Japan's machine might have a million or more small processors operating in parallel.

The fifth-generation machine may be able to perform up to 70 times more calculations each second, and have 3000 times the internal memory of supercomputers now in use, such as Cray-1. (The fifth-generation designation follows four earlier technologies: vacuum tubes, transistors, integrated circuits, and large-scale-integration chips.)

What will such computers do? "This project is the Space Shuttle in the world of knowledge," University of Tokyo professor Tohru Moto-oka has said. Two target applications are language translation and consultation systems. The goal with translations is for multiple languages, a 100,000-word vocabulary, and 90% translation accuracy. The remaining 10% would be handled by humans.

Consultation systems include medical diagnosis, natural-language and speech interfaces, intelligent-computer-aided design, the ability to be tailored for use as an expert consultant in diverse subjects, and computer troubleshooting and diagnosis.

The goal is to include a capability for semi-automated knowledge acquisition. The computer may, for instance, monitor news reports, read books and newspapers, draw information from other computer data bases, or simply listen to an academic lecture. It would decide what to remember and what to ignore with a minimal amount of human intervention.

The formal program to build the world's most advanced

Continued next page

Fifth-generation computers

Continued from page 13

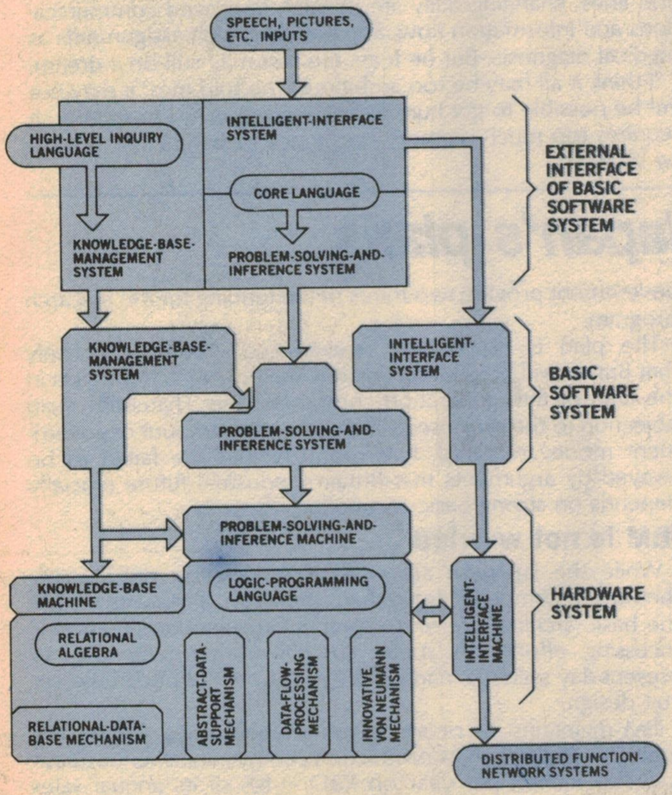
computer began in late 1981 when, after three years of planning, Japan's Ministry of International Trade and Industry announced the $300 million fifth-generation-computer projects. Funds were committed in advance for the first three years of work. The ministry, which operates ETL and other laboratories, pooled resources with eight of Japan's largest electronics firms to open the Institute for New Generation Computer Technology (ICOT) in April 1982. ICOT's mandate is to develop a new computer family with the software and hardware for AI.

Though the US still leads in AI research, efforts concentrate on software for the current crop of computers. ICOT takes a different view: . . . [Computers] must evolve from machines centred around numerical computation to machines that can assess the meaning of information and understand the problems to be solved," states ICOT's research-and-development plan. The first step is to design and build "mechanisms for inference, association, and learning in hardware".

That's a tall order. "User-friendly" software is just becoming commonplace for today's computers, and expert-system software remains largely experimental. The Japanese intend to create "Man-machine interfaces that are natural to man". That means talking to the computer or typing instructions in everyday language; showing it charts, graphics, and even photos; and getting back information the same way.

Beyond von Neumann architecture

In their work, computer engineers speak of a machine's "architecture". The term refers to the general design of the circuitry, the overall logical scheme by which it will take in information, manipulate it, and produce a result. To date, essentially all computers have used so-called "von Neumann architecture", which grew out of the work of the famous mathematician. In a standard von Neumann machine, a single central-processing unit (CPU) handles calculations. Each step is performed individually, one after the other. Each calculation is called a floating-point operation and a computer's speed is measured by how many million operations it can perform each second. In computerese, this measurement becomes a "megaflop". Large main-frame computers today are typically rated at around two megaflops.



The fifth-generation computer system will be based on a large number of VLSI (Very Large Scale Integration) chips, each with a central processor, memory and communications circuits to speed computing by parallel processing – solving problems by operating on many small portions simultaneously.

But regardless of whether the computer is performing an arithmetic calculation or translating a word from Japanese to English by comparing data with information in its memory, a von Neumann machine performs one task at a time according to the sequence in its program.

This step-at-a-time sequence is too slow when huge amounts of data must be arithmetically processed – in "number-crunching" computations such as weather forecasting, for example. For this, computer scientists came up with a technique called parallel processing, and engineers devised the computer architecture to handle it. A few advanced supercomputers, such as the Cray-1 and Control Data Cyber 205, have multiple processor chips to divide up the work under control of a central processor. These processors can speed computations greatly by solving portions of a problem simultaneously – in parallel. The processors could translate many words at one time between languages if given the task, but these supercomputers are used for scientific "number crunching", not as general purpose machines.

The Cray can theoretically run at 140 megaflops, and the Cyber 205, it's claimed, can perform 800 megaflops for rare categories of pure mathematical calculations. But in practice, programming complexities often limit both machines to 20 megaflops.

A special form of parallel processing, called dataflow, was first proposed at the Massachusetts Institute of Technology to increase computing speed still further. The dataflow idea requires a computer with a large number of processors, each with small amounts of individual memory and all embedded in a complex communications network that allows free exchange of data between any two processors without going through a central processor. The processors operate on data depending on "tags" attached to it; after performing a calculation, the processor tags its data and passes this portion of the overall solution – it might be a language translation – on to the next processor. These multiple operations happen simultaneously until the last two results funnel into a single processor, which performs the final calculation. A variety of experimental dataflow-architecture machines are being built.

Obviously, fifth-generation project engineers are looking at advanced architectural schemes for their projected machines. But despite reports in the Western world, Dr Kasuhiro Fuchi, director of the ICOT Research Centre in Tokyo, said the first machine will not be based on dataflow architecture. It will pursue new and yet-to-be-defined architecture designed solely for an inferential computer.

"We think we can take advantage of dataflow," Dr Fuchi said, "but we will pursue parallel-type processing well advanced beyond that concept."

The Japanese expect their fifth-generation computer to be rated between 1000 and 10,000 megaflops for general use. To get there, they will design a machine with many small processors – a million or more packed into VLSI chips is not out of the question – to handle simultaneous operations.

Very high speed will be essential for an AI computer that must race through its memory banks to make inferences. In simplest form, that means reaching a conclusion based on available facts, then using that conclusion as if it were a fact already stored in memory. To make one inference, a computer requires between 100 and 1000 steps. The best

Continued on page 16

Fifth-generation computers

Continued from page 15

machines today can handle only 10,000 logical inferences per second (LIPS). "Our target is between 100,000 and one million LIPS," Dr Fuchi told me. "That will be a true knowledge-base machine."

The differences between the data-base computers of 1983 and the 1992 knowledge-base computer are profound. A data base, Dr Fuchi said, is simply a collection of facts. A knowledge base includes facts, instructions on how to use the facts, and information on how the facts relate.

More important, computers now need software to use a data base. The Japanese plan to build their knowledge-base core into the hardware. It will be an integral part of circuit design.

"Our initial hardware work will be analysing everything about known VLSI technology and building a prototype machine," Dr Fuchi said. "But the prototype at the end of the initial development stage will be very primitive compared with the prototype at the end of 10 years."

The first fifth-generation prototype, to be ready by 1985, will be a personal computer. This small computer will not use parallel processing but it will be the test bed for new high-speed VLSI circuits. It will have an amazing 80 megabytes of internal memory.

> "Our national strategy in computers has always been to match IBM. Now we have changed. Instead of equalling IBM, we want to develop new technologies"

In the final three years of the project, ICOT will produce and test an all-new prototype computer to be called the parallel inferential machine. It will blend the earlier work into one machine intended to meet all goals. Its active internal memory will not be sized for several more years, Dr Fuchi said, but it will be at least 100 million bytes – or the same as 3125 Cray-1 supercomputers.

Dr Fuchi expects no problem in developing the basic VLSI chip for the fifth-generation computer. But tying as many as one million chips, each containing a processor, some memory, communications links, and perhaps other circuits, into a workable system is a formidable task. And it's compounded by the need to design and integrate the communications network, main memory, and other elements into the computer.

In addition, ICOT is seeking international co-operation, both from other governments and from private industry, particularly IBM, which is both feared and respected in Japan. "Japan has succeeded in catching up with US technology," Yoneji Masuda told me. "And with IBM." Masuda is a computer expert, technical consultant and adviser to high Japanese officials, and president of The Institute for the Information Society, an international group working on dataflow and information questions. To the Japanese, Masuda said, IBM represents the pinnacle of computer superiority.

"Our national strategy in computers has always been to match IBM," he said. "Now we have changed. Instead of equalling IBM, we want to develop new technologies."

All participants in the fifth-generation project will share in its success, Fuchi said. France and Great Britain have expressed interest in helping. Neither the US government nor IBM has done so.

"I hope IBM will change its basic philosophy," Masuda said. "Of course they should have their own long-range strategy, but they also should look at their worldwide responsibility in the information-processing arena."

Is the project realistic? The Japanese government is convinced it is. So are the country's electronic giants, who expect to use fifth-generation technology to create vast new families of computers and related products.

Yoneji Masuda isn't so sure. He does foresee versions of the new computer expertly managing robot teams along production lines, changing daily life through improved communications and information flow, and handling such assignments as medical diagnosis. But he fears the rest may still be a dream.

"I think it all may be too ambitious," he told me. "It may not yet be possible to get humanlike association in a computer. It requires too much memory, too much logic. But still, it must be started."

International response to Japan's plans

Japan's invitation to other nations to join it in its fifth generation computer project has so far met with a poor response. Most countries recognise the challenge of the Japanese initiative but prefer to go it alone.

"The government, universities and companies – they're all doing their own thing. To expect them to pool their resources like the Japanese is impossible". That comment, from a researcher at one of Britain's biggest electronics companies, sums up the difficulties that British industry faces in trying to decide how to respond to the Japanese plans.

Last year, Kenneth Baker, Britain's minister for information technology, set up a special committee to advise on the path that British industry should follow in response to the Japanese. Called the Alvey Committee, after its chairman, John Alvey of British Telecom, the group reported in March this year, recommending a five year plan for co-ordinated research in advanced computing techniques, including dataflow machines and parallel processing, at a cost of £350 million.

Britain's part in any research program now looks doubtful, however. Just before the general election earlier this year Prime Minister Margaret Thatcher rejected the recommendations of the Alvey committee. She is reported to have "kicked over the tables" in consternation at the proposal that the government provide two-thirds of the funding for the research program.

The plan is now being re-examined, but it is unlikely that Britain will be undertaking any major research projects in the area of fifth generation computers. Mrs Thatcher's main objection to the proposed scheme was the amount of government money required. It is reported that she failed to be swayed by arguments that Britain's industrial future crucially depends on strong basic computing research.

IBM is not worried

While the Japanese are seeking to develop radical new theories of computer design and operation, IBM believes that the basic architecture of its computers is satisfactory, and is focussing efforts on small, cumulative improvements to present-day systems, particularly in the area of integrated circuit design.

IBM maintains 30 or so research laboratories around the world, in addition to its production centres, and spends about $A2,600 million per year on R&D – 8% of its annual sales revenue.

IBM's most powerful computer, the 380X series, uses about one million circuits (each consisting of four or five transistors) distributed over 3000 logic chips. Experiments in higher density chip fabrication are continuing, with efforts concentrated on the use of electron beams to etch new chip designs.

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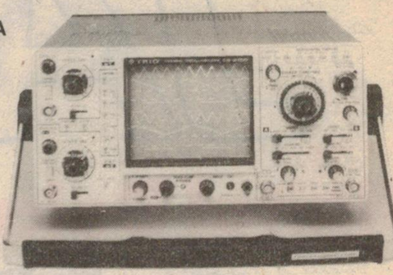

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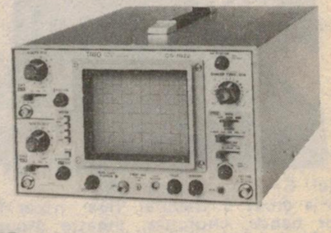

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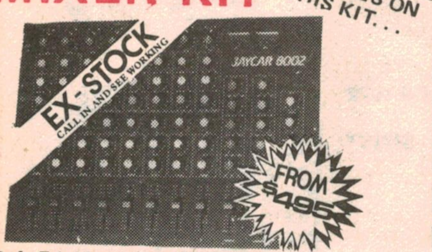

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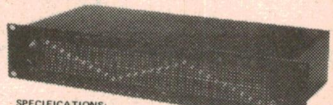

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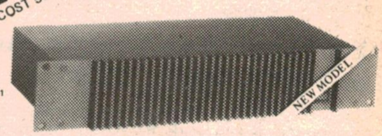

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Supertext Captions: TV for the

As from May 6, 1983, the Australian TV scene has had a new and very valuable feature; a caption or sub-title system for the hard-of-hearing. Based on the teletext system, it will help viewers with hearing problems to derive the same enjoyment from TV programs as do their more fortunate companions.

by PHILIP WATSON

The technology to provide this service has been available for several years. As far back as 1977, Sydney's TCN-9 was running an experimental teletext service (EA, September 1977), and ATN-7 commenced a similar experiment in 1979 (EA, April 1980). Then, early in 1980 the Federal Government put things on an official basis by authorising a public teletext service.

The main thought behind the concept at that time was to provide a magazine type service, offering weather reports, sporting details, news updates, race dividends, entertainments lists, etc, and this is the basis of the current "Seven Text" service from ATN-7.

But, in the background, there has always been the concept of a caption service. In fact, the teletext system was originally developed for just this purpose but, somewhere along the way, became sidetracked into the more commercial application. Now it appears to have come full circle, but side-by-side with the broader application.

How important is such a caption service? According to the Australian Caption Centre, which provides the service, surveys indicate that there are over one million Australians who suffer hearing difficulties and that there are some 12% of TV households who have at least one occupant who cannot enjoy TV because of a hearing problem.

And a frequent by-product of such situations is a certain amount of domestic conflict; if the victim tries to overcome the problem by turning up the volume the situation becomes intolerable for the rest of the household.

It is on the basis of this need that the new service – called Supertext – and the Australian Caption Centre was created. The Centre is an independent, non-profit organisation, set up with Federal Government funds, and maintained by payments from the television industry.

How it works

Just how does the whole system work, both technically and artistically? It is not the purpose of this article to delve too deeply into the technicalities of teletext; this has already been done in the two articles referred to, plus a third article in the 1981-82 VideoMag Annual. But some superficial knowledge will help the reader to appreciate what is involved.

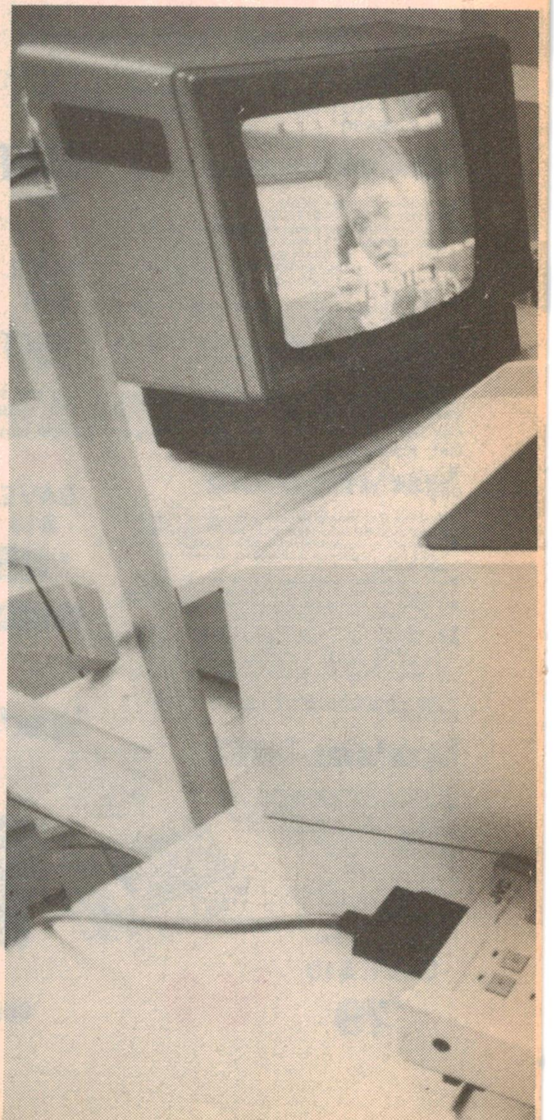
Teletext information is transmitted during an otherwise unused period in the TV transmission. Between the finish of one vertical scan (field) of the TV image and the commencement of the next field, there is a so-called blanking period amounting to about 25 lines during which no image is transmitted. In a sense the lines are wasted, but the blanking period is an essential part of the system.

But while these lines are wasted as regards the main TV image, they can be used to carry other information, and this is where engineers put the teletext signal. Originally they used two of these lines, lines 19 and 20 for the first field and lines 332 and 333 on the next (interlaced) field.

Each of these two lines carries enough information to provide one 40 character line on the TV screen, and a full screen contains 24 such lines. Thus it requires 12 fields, and takes 0.24 seconds, to complete one page. Such a system could contain 100 pages and it would take 24 seconds to scan each one in turn.

At the receiver, which must be specially designed or adapted for teletext, the user feeds the page number he wants into a keyboard and the system waits for this page number to come around. As already explained, this could take up to 24 seconds.

Program captioning equipment at the Australian Caption Centre, Sydney.

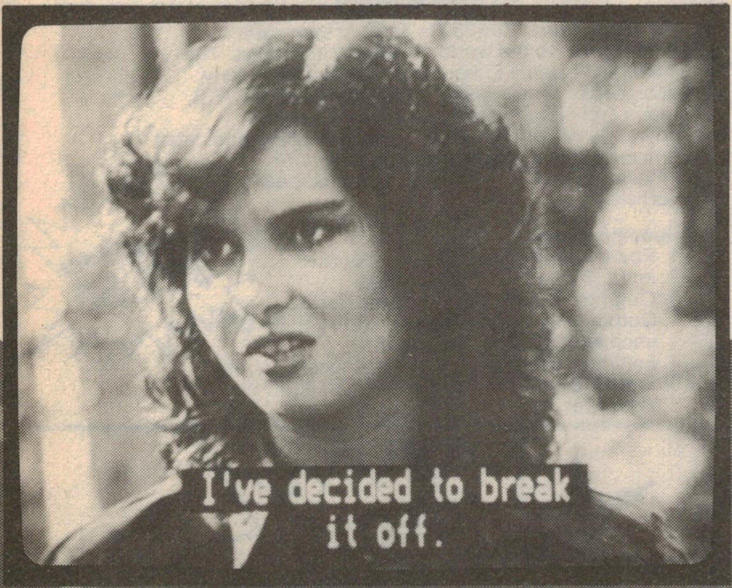


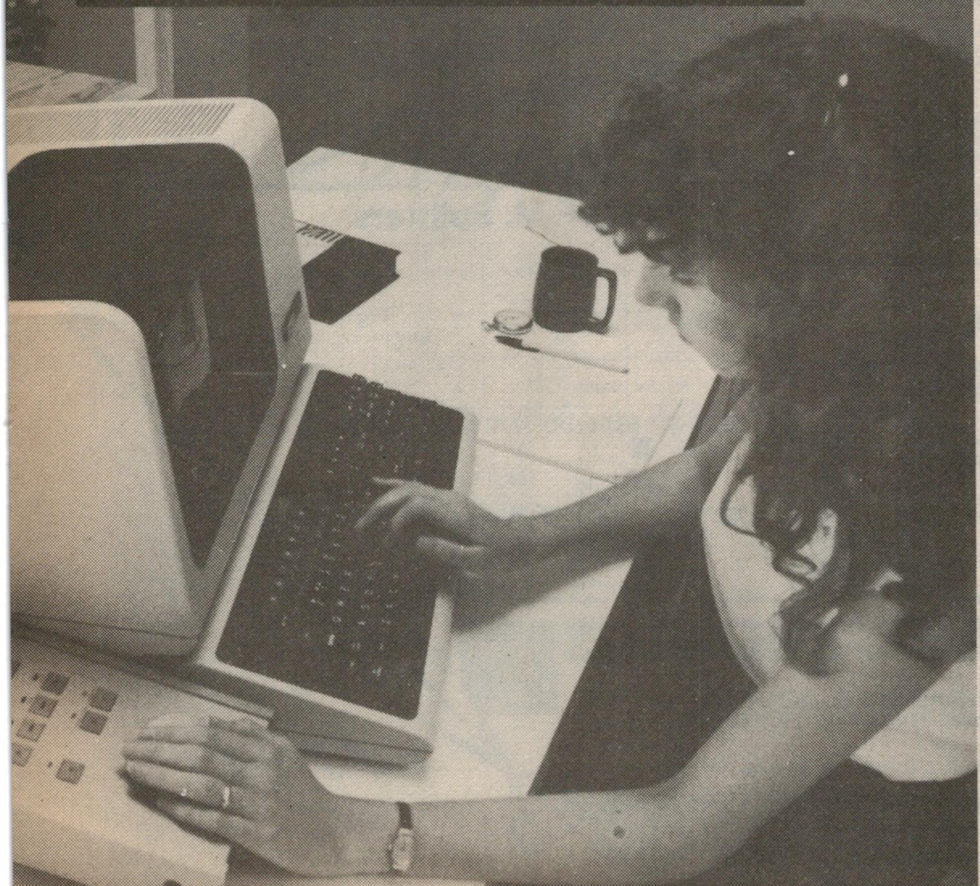
deaf

When the page number does appear the decoder recognises it, stores the information from the following fields until the full page has been presented, then displays it on the TV screen. As an alternative to a full 24 lines, some pages may present only one or two lines superimposed on the bottom of the TV picture. This technique may be used for news flashes or obviously, a caption service.

(More recently, the Australian teletext standards have been upgraded to four lines per field; lines 15, 16, 19, 20 for the first field, and 328, 329, 332, 333 for the second field. This allows a much larger magazine for the same access time, or a shorter access time for the previous magazine size.)

In order to provide a caption service, one fundamental limitation of the teletext system – access time – has to be overcome. While it is easy enough to dedicate one page of a complete magazine to the captions, the time needed to locate or update this page – more than 20 seconds – is quite unacceptable for a caption service, which requires a virtually instant response.





At left: A scene from "Sons and Daughters" showing a typical caption. Below: The Caption Centre in operation. Effects unit on operator's left produces timing signals and fade-outs, etc.

There have been two approaches to this problem. In the U.K. – where teletext was born, incidentally – they use a page priority system. The sub-title page is given priority on the basis that, every time it is updated, its page number is immediately inserted between the regular page numbers, out of sequence. The result is a virtually instant response to the update and, by all accounts, the system works extremely well.

Australia has chosen a different system. It has provided an extra line per field; line 21 for the first field and line 334 for the second field, and these are used exclusively for the caption service. Again, the response is virtually instantaneous. And to further simplify matters for the viewer, the same page number, 801, is used by all TV stations.

So much for what might be termed the hardware of the system. Just how are the sub-titles prepared and married to the original film or tape?

The Caption Centre

When a TV station requires a program to be sub-titled they send a time-coded tape copy to the Caption Centre. This is then viewed by skilled sub-titlers who prepare suitable sub-titles. The need for skill in this operation may not be immediately obvious, but the requirement is more than simply repeating the original dialog, verbatim, in printed form.

A major problem is that the spoken dialog is often much too long to put in caption form. This may be due, in part, to the space available for the caption but, more importantly, to the need to cope with the average person's reading speed. While the average person can assimilate the spoken word at about 200 words a minute, they can only cope with the written word at about 120 words a minute.

As a result, lengthy speeches have to be abbreviated – while taking care to retain all their shades of meaning – to allow the viewer to digest them in time for the next caption, covering speech by another character.

In addition, the spoken word does not always retain the same shade of meaning in printed form, and may have to be edited to convey the correct meaning. Hence the need for skilled operators to create the sub-titles.

Another trick used by the titlers is to assign different colours to the captions for different characters, thus further simplifying the viewer's job of following the dialog. The system is also so arranged that the captions always appear on a plain background, rather than the picture itself, which may sometimes prove distracting or provide insufficient contrast.

As well as speech, there are other sounds, particularly "off-screen" sounds,

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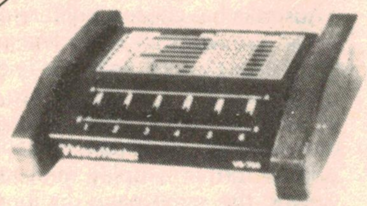

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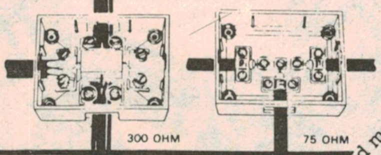

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such as pistol shots, door knocks, vehicle crashes etc, which the viewer needs to be aware of if he is to follow the plot. These are dealt with by means of explanatory captions.

When the wording of a particular subtitle has been finalised it is typed into a computer keyboard, together with the time code, and stored on a floppy disk. When completed, the tape is returned to the TV station, with the disk. The disk may then be run, with the master tape, directly to air or, more usually, used to make a new tape containing the sub-title information directly. Additional tape copies may also be made for distribution to other stations.

In theory, at least, such a tape can be played by any TV station, whether it has teletext facilities or not, and provide the sub-title facility for any teletext receiver within range. In practice there may sometimes be problems, such as the transmitter having inadequate bandwidth to handle the teletext signals, or being programmed not to transmit any video during the blanking period. This, in turn, would be due to the presence of test signals in the blanking period, for internal use only.

And how many programs will carry captions? At the time of writing a mere nine programs a week are being presented, with one more promised, but everyone hopes that this can be substantially increased in the future. Most of these are on Channel 2, but ATN-7 is captioning "Sons and Daughters" and TEN-10 is planning to include "Carson's Law".

The snag is the cost. The Caption Centre charges $680 for a typical half hour show and, we understand, it could cost as much again at the TV station in handling and duplicating cost. Thus "Sons and Daughters" would cost around $1360 an episode, or around $6800 a week.

Captioned programs

Barchester Chronicles (Ch 2)
Tenko (Ch 2)
Our World (Ch 2)
Your Life in Their Hands (Ch 2)
The Fourth Arm (Ch 2)
The Long Search (Ch 2)
The World We Share (Ch 2)
The Two Ronnies (Ch 2)
Sons and Daughters (Ch 7)
60 Minutes (Ch 9)
Carson's Law (Ch 10) (Coming)

At the time of writing, ABN-2 has nearly eight hours of sub-titled programs each week, and the reader can work out the cost for himself. At the same time the Caption Centre points out that they hope to bring these costs down as the volume of work increases.

What you need

Finally, how does the individual viewer, who has a need for this facility, go about taking advantage of it? What hardware is available and what is it likely to cost?

Broadly, there are two approaches: buy a new set which incorporates the teletext facility, or buy an adapter to add to an existing set. There are several sets on the Australian market which offer the teletext facility, including Blaupunkt, Philips, and Sony. In general terms, a teletext equipped receiver will cost about $250 more than the same type without teletext.

The adapter approach is quite different. A true adapter (as distinct from a retrofitted decoder) is a self contained unit, external to the set, which is simply interposed between the TV antenna and the antenna terminals of the set. Most suffer from some limitations in regard to their presentation of captions, but they can offer some advantages as well.

The simplest types, while they can decode the captions, cannot retain the plain background generated at the caption centre; they present the text against the picture, which may or may not be suitable. Also, they usually present the captions in monochrome only. More elaborate models retain the plain background, but may still be limited to monochrome titles.

On the positive side the use of an adapter makes it possible to record a program and retain the captions, something which is not possible when using a receiver with a built-in decoder.

While, in theory, the VCR should be able to record the teletext information along with the normal video signal, and will in fact attempt to do this, the recording bandwidth is totally inadequate for the teletext signal, which is quite demanding in this regard.

A typical adapter is marketed by Radofin Electronics, of Bondi, NSW and is designated the Radofin Adam 180ST (ST for subtitles) and sells for $525. While it presents the captions in monochrome only, it does retain the plain background.

The adapter is distributed through Commodore TV in NSW, and O'Donnell Griffin in Queensland. Readers in other states should deal directly with Radofin Electronics, 5 Curlewis St., Bondi, NSW, 2026.

Another approach is to fit a decoder into an existing set (retrofitting). Not all sets are suitable to be so fitted but one NSW firm provides such a service if the set is suitable. The cost to supply and fit a board is about $300, plus tax. The firm is Teletext Communication Technology, PO Box 1502, Hornsby, NSW 2077.

Yet another option is to rent a suitable set, and this offers the advantage of being able to sample the system without a serious financial commitment. Many rental organisations offer an option of purchase at attractive terms after a trial period.

And finally a word of warning. Teletext signals in general are easily upset by poor reception conditions, such as ghosts, noise, etc. Prospective purchasers would be very wise to insist on an in-house demonstration of any unit — complete receiver or adapter — which they are contemplating buying. Also, if performance is less than perfect, be very sceptical of any excuses offered by the salesman.

So there it is; it is not cheap, but the service is there if it is needed. And a point to remember is that, having invested in the facility for captions, it also provides the normal teletext service where this is available.

The role of scientific models

AM transmissions and the time domain

This article was prompted by the recent discussion in "Electronics Australia" concerning the nature of amplitude modulation. It seeks to show that the argument between protagonists concerning the frequency and time domain concepts is really no argument at all; simply a different way of looking at the same thing.

by DR. JOHN KENNEWELL*

The universe is a complex of matter and energy with the most intricate and subtle interactions underlying its fabric. In our attempts to understand this structure we devise models. The purpose of these models is to help us understand the particular aspect of nature we are studying. The models may be physical, mathematical or otherwise, but whatever their form, they are always analogs only of the fundamental object of our study. Sometimes the complexity of an object requires more than one model (or way of thought) to describe it fully.

Invariably, in such cases, one is led to ask which model more correctly describes the object (or process) we are trying to understand. The answer, of course, is that all models are required for a full understanding of the phenomenon; sometimes one model has precedence, and sometimes another, according to the situation. None is complete in itself.

One practical example of the above which has been well known to physicists since the early part of this century is the wave-particle duality which appears to be expressed by very small elements of matter. In some experiments, electrons appear to resemble bullet-like particles whereas in others they show properties just like water waves. What is the resolution of this apparent dilemma? Are electrons waves or are they particles? Or do they change, like Dr Jekyll and Mr Hyde, from one moment to the next?

The answer to the last question is no, they don't change, and the answer to the previous question is that electrons are neither waves nor particles. The resolution to the dilemma is that electrons are electrons. They are totally different to anything in our macroscopic world of which we have experience — such as water waves or bullets. Thus, it is impossible for us to construct one physical model that totally describes or is analagous to the behaviour of real electrons.

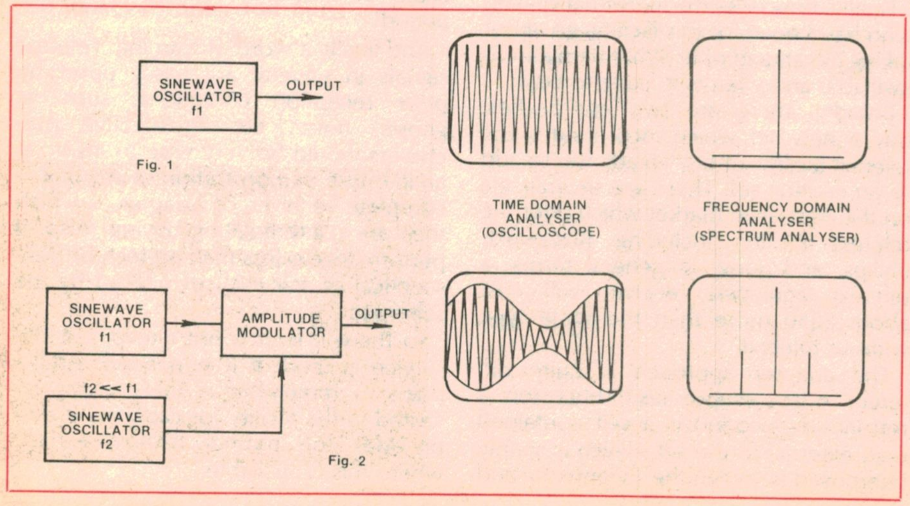
Another example, which is the prime concern of this note, is the understanding of time-varying or frequency-spread electrical signals. And already, in describing the problem, I have introduced the duality of understanding that is necessary for a complete description. The concepts of time and frequency are well known to all, although the expression of processes in the time domain is more comfortable to most of us. In the case of electrical signals, their variation in the time domain can be readily seen on an oscilloscope screen.

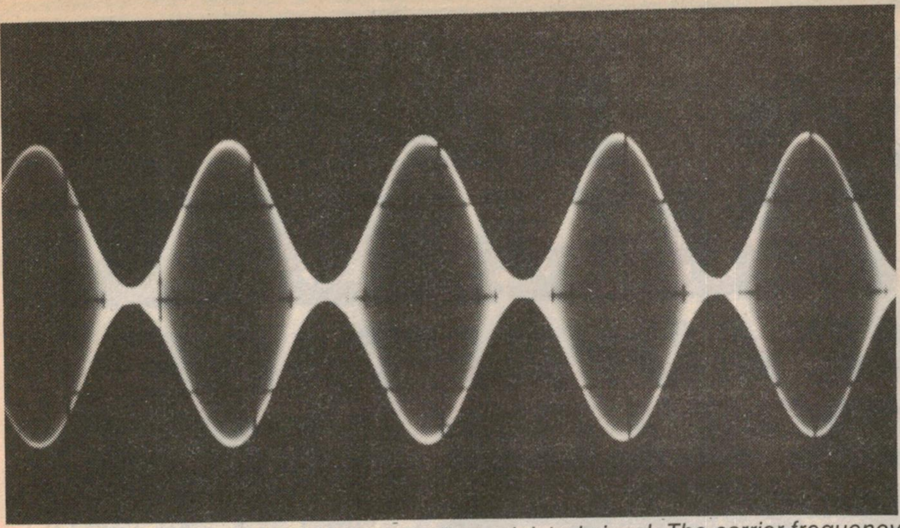
Behaviour in the frequency domain usually requires some form of spectrum analyser for its display. The word domain is used here to mean that set (or group) of possible values over which a signal may vary. In the time domain, a sine wave is described by specifying amplitude values for each instant of time that the sine wave exists. In the frequency domain the power of the sine wave at every possible frequency could be specified. For a theoretically pure oscillation, that has and always continues to exist, this specification would be a single non-zero value at the frequency of oscillation.

An experimental setup to illustrate the above discussion is shown in Fig. (1) where an oscilloscope and a spectrum analyser are used to display the output of a sinusoidal generator (f_1) in the time domain and frequency domain respectively. A similar analysis can also be done mathematically (see box).

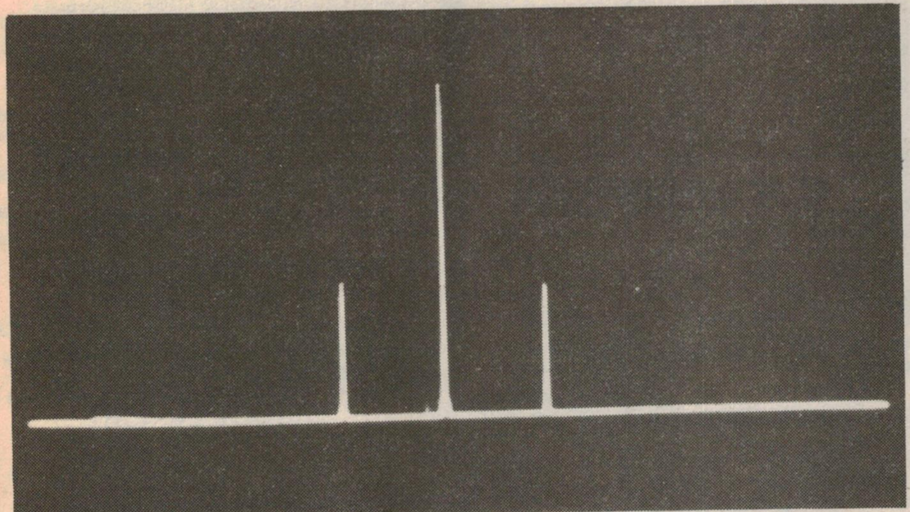
Up to this point, everybody is probably still quite happy. The problems start to arise when we modulate f_1 with a much

* Learmouth Solar Observatory, W.A. Ionospheric Prediction Service, DST.





Time domain presentation of an amplitude modulated signal. The carrier frequency f_1 is 33.43MHz and the modulation frequency f_2 is 24kHz. Percentage modulation is just under 100%.



Frequency domain presentation of the same signal showing the carrier and sideband components. The spectrum analyser bandwidth was 300Hz.

lower frequency f_2. Fig. 2 shows the resulting time and frequency domain displays. The problems arise because some people insist that the time-domain display is maybe not a valid way of viewing the situation. To quote from *Electronics Australia,* January 1983 (p.99), "When an AM signal is viewed on an oscilloscope, it appears as if the carrier signal is varying in amplitude. The reason this occurs is because the oscilloscope receives three different frequencies and algebraically adds them together."

This reasoning, however, is incompatible with the domain of interest – that of time. The oscilloscope is a time domain display device and at each instant of time has a voltage presented to its Y-terminals which it, within certain conditions, displays faithfully along the time or X-axis on its CRT. An oscilloscope does not receive frequencies – it receives and displays voltages as a function of time. When we look at this display it does indeed appear as if the amplitude of the carrier is varying, and we should have no compunction about applying the principle of parsimony and say that, *in the time domain,* this is in fact what is occurring.

At this stage the antagonists are jumping angrily out of their seats and pointing to the frequency domain display. Here we see three spikes. The middle and largest one is centred at f_1, and a smaller one appears on each side. All three spikes show a rock steady amplitude. There, you say, that proves that the amplitude of the carrier signal does not change! But, in fact, we are now looking at the situation using different constructs (if you like, a different model or way of thinking), and how we interpret this display cannot really change the first display (as long as there is no fault in the first display). This is not simply philosophical goobledegook as I shall try to show.

The frequency and the time domain in mathematics

Constructs of reality can be made in physical models or in mathematical models. The latter are usually economical and are frequently easily manipulated to yield information about the modelled system. In the time domain, an unmodulated RF carrier is modelled by the mathematical function:

$$h(t) = A \sin(2\pi f_1 t)$$

When amplitude modulation is introduced the modelling function becomes:

$$g(t) = A(1 + m\cos(2\pi f_2 t))\sin(2\pi f_1 t)$$

where 100m is the percentage modulation. Plotting this function graphically is equivalent to displaying the respective voltage on an oscilloscope screen. To examine the frequency domain of this voltage a spectrum analyser is used. An equivalent operation on g(t) can be done mathematically using a device known as a Fourier transform, such that the frequency domain is given by:

$$G(f) = \int_{-\infty}^{\infty} e^{-j2\pi ft}\, g(t)\, dt$$

There also exists an inverse Fourier transform which allows one to go from the frequency to the time domain. This is given by the formula:

$$g(t) = \int_{-\infty}^{\infty} e^{j2\pi ft}\, G(f) df$$

Evaluating the transform integral to find G(f) for a particular g(t) is sometimes quite difficult and requires computer numerical assistance. For the AM g(t) function given above, however, we do not need to evaluate the integral, as a simple trigonometric identity can be used to rewrite the model as:

$$g(t) = A\sin(2\pi f_1 t) + \frac{Am}{2}\sin(2\pi\{f_1+f_2\}t) + \frac{Am}{2}\sin(2\pi\{f_1-f_2\}t)$$

which clearly shows the three frequency component amplitudes present. By inspection we can write the frequency domain function as:

$$G(f) = A\delta_{f,f_1} + \frac{Am}{2}\delta_{f,(f_1+f_2)} + \frac{Am}{2}\delta_{f,(f_1-f_2)}$$

where the symbol δ_{AB} is called a Kronecker delta function and has the value of one when A = B and zero elsewhere.

In the experimental setup of Fig. 2 I would now like to consider what happens when the modulating frequency f_2 is reduced to a very low value say 1Hz. In most real spectrum analysers we see a very interesting phenomenon. The central spike is no longer constant but starts bouncing up and down once per second. That is, the amplitude of the carrier appears no longer to be constant. At this point some astute people will again start yelling at me for being unfair; because something else has happened that has not been mentioned.

As we reduced the frequency f_2 down to 1Hz the sideband peaks drew closer and closer to the central peak until they became indistinguishable from one another. If we had a very expensive spectrum analyser we might be able to increase the frequency resolution until the two sideband peaks again become separately visible. Upon doing so we would observe that the central peak was again constant in amplitude. We would also observe that when initially switching on oscillator f_1, it took some time for this central peak to rise to its full amplitude. All these observations should give us a clue as to what this type of frequency domain display is actually showing us.

It is the integration time of the spectrum analyser that provides us with the answer. When the display is showing resolvable sidebands, it is of necessity integrating each frequency along the X-axis for a time equal to at least one complete cycle of the modulation frequency. Thus, this display is showing us the average power of the carrier frequency. And the average is computed over a full modulation period.

This concept of average power has no direct meaning to the time domain display (which is concerned with instantaneous amplitudes) and thus, as previously stated, an interpretation in the frequency domain cannot contradict the interpretation in the time domain. The two views are complementary to one another.

As with the wave-particle duality in matter, both the time domain and frequency domain viewpoints are necessary to fully understand the nature of varying electrical signals and the physical processes, such as modulation and demodulation, that they may undergo. Sometimes it may be possible to describe a process from both viewpoints. Many times it will be found that one viewpoint is superior to the other in providing a clear or easily understood explanation of what is happening. Two examples come readily to mind. When designing filters (eg, in IF amplifiers), the frequency domain viewpoint is paramount in matching the filter bandwidth to the signal components present.

On the other hand, the time domain viewpoint of demodulation (rectification and capacitor filling in the gaps) is usually the easiest explanation for most people to understand. It is also not incompatible with the frequency domain viewpoint. It is simply different. One cannot say that the three RF components would be shunted to earth in this description, because in the time domain description there are no three RF components — there is only one time-varying signal.

Conclusion

The basic argument presented above relies on the axiom that in our attempt to understand nature we build constructs that simplify a particular phenomenon to the point where we can perform useful operations (physically or mathematically) on selected aspects of the phenomenon. How useful our constructs are is dependent on how closely they model the real world. Some phenomena require multiple constructs to appreciate fully the nature of the beast in question. Each construct then gives us a different way of looking at the whole.

We should not lightly discard constructs that appear simplistic in the presence of what may at first appear to be more elegant and elaborate constructs. The former may serve us well without sacrificing the ultimate reality (which is probably mortally unknowable anyway). Yes, there really is a time domain!

Additional Reading:

A very interesting text which studies how completely science may describe the universe is: "Completeness in Science", by Richard Schlegel (Appleton-Century-Crofts, New York 1967).

A detailed description of the mathematical modelling and analysis of communication processes is given in: "Frequency Analysis, Modulation and Noise", by Stanford Goldman (McGraw-Hill, 1948/Dover, 1967).

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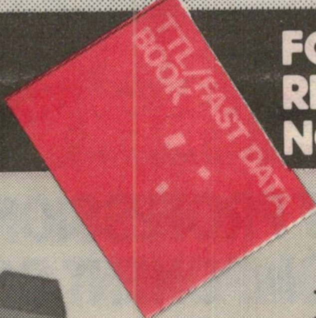

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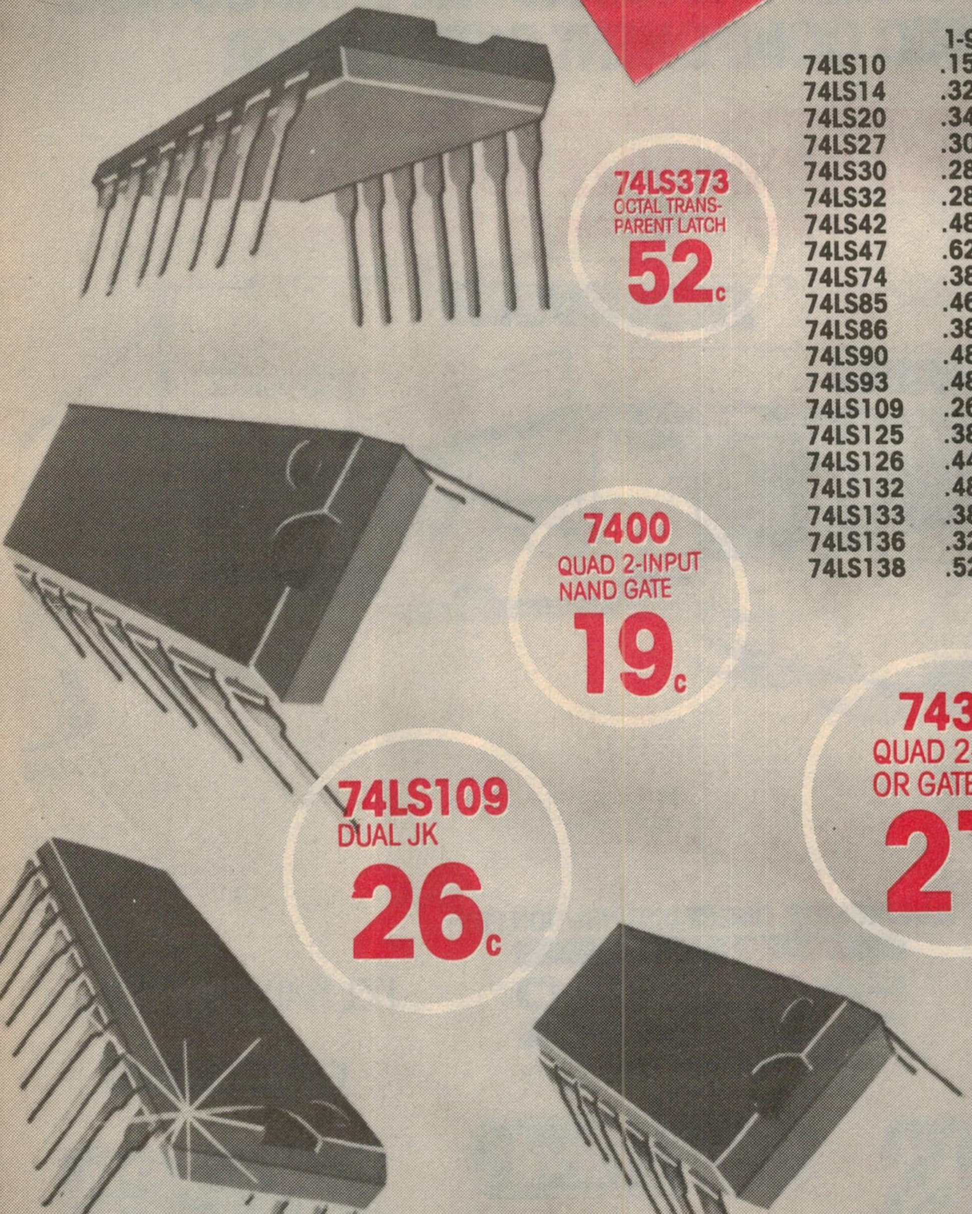

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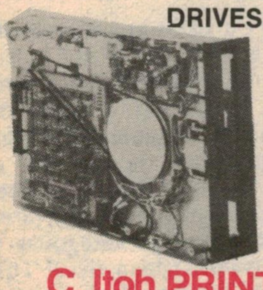

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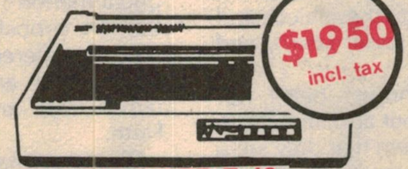

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UFO's: Time for

The study of UFOs has tended to attract cranks
But behind the more bizarre, outlandish aspects

Jenny Randles and Peter Warrington

THREE years ago James Obert won the *New Scientist*/Cutty Sark competition for his essay on unidentified flying objects. His entry, "The failure of the science of ufology", attacked the very existence of such a subject (*New Scientist*, vol 84, p102). But was that the end of the story? Is there indeed no science to be found in the study of the phenomena of UFOs?

The first person in Britain to receive a grant for a scientific study of the UFO phenomenon is a sociologist, Shirley McIver of York University. She took her doctorate in the study of the UFO movement itself, and has worked with several British researchers on what has turned out to be an illuminating project. Her social questionnaires have delved into the motivations of those individuals involved with the subject, and she has tried to discover their opinions, social status, and political and religious affiliations.

The UFO community works principally through belief, not only in the existence of inexplicable UFOs, but also, usually, in some quite bizarre theory of their origin, often that they are a form of alien technology. Ufologists include a cross-section of the population spanning pseudo-religious fanatics to reasonably careful researchers. Indeed it is surprising that more studies have not been coducted in a field that, whatever else it may be, is surely one of the world's most remarkable systems of belief.

These social-science studies have shown that the average lifetime of a ufologist is about two years, after which the individual faces a crisis point. He, or she, finds that the reality of the subject is not what he desired it to be and that he cannot even prove its basic tenets. This relegates the whole subject to one of belief, of having faith in a non-provable hypothesis. Indeed it is possible that many people recognise subconsciously that the hypothesis is not merely unprovable, but false; certainly many drift away from an active interest in the subject.

The bulk of those who remain interested in UFOs seem less likely to have been motivated by personal experience and are more willing to undergo the reappraisal needed to rationalise their approach. The first symptom of such a change is to accept that all past data collected on UFOs are, in scientific terms, largely useless. This fact is reflected in the falling number of reports collected by the British UFO Research Association. A switch of emphasis, backed up by education, internal accreditisation and a definition of standards, has led the association away from superficial reports on all observations of UFOs to more detailed case-files on selected events. In this way researchers are able to search for direct comparisons between reports and to isolate categories of phenomena. It turns out that there is no single mythical "UFO phenomenon"; instead there is a collection of phenomena that are probably independent and which may well require several different mechanisms to explain them all. Such phenomena are not manifestations of alien technology; rather, they are phenomena that occur naturally here on Earth.

Of course many pitfalls may lie in wait at this point of the research. But it is possible, with caution, to isolate categories of UFO with general characteristics. An example of one category of UFO, which some researchers have pinpointed, is of objects with an ovoid shape from one to three metres in diameter, which rotate on a vertical axis, close to the ground, and which *appear* to emit a wide range of electromagnetic radiation.

Perhaps what is most important is that the nature of such identifiable UFO categories, and the conditions under which they might be observed, are predictable, after careful analysis of the data. Scientific searches, with appropriate instrumentation, are now able to prove once and for all that

Jenny Randles is director of investigations for the British UFO Research Association and was co-author with Peter Warrington of *UFOs: A British Viewpoint* (Robert Hale, 1979).

rational studies

rather than scientists, for good reasons. of ufology lie some phenomena worth of study

these "UFOs" do exist, and can provide information about their nature. To distinguish such phenomena from more dubious data, we propose that they should be renamed "UAPs", for unidentified atmospheric phenomena, as this seems to be an appropriate and adequate description.

What is lacking at this stage is for some imaginative research laboratory or university department to contact serious UFO researchers and design an experimental study for these UAPs. In the US, Harley Rutledge, head of the physics department at Southeast Missouri State University, has conducted a pilot study, with some encouraging results. His researchers made excellent observations on 178 separate UAPs which Rutledge has published in *Project Identification* (Prentice Hall, 1981).

Once there are more data available, and the phenomena are established as real, the way is open for theorising about the nature of UAPs. But there has already been some progress in this direction. Michael Persinger, associate professor of psychology at Laurentian University in Ontario, has proposed that some UAPs are a consequence of the piezo-electric effect. In essence he is arguing that strain in certain types of underground rock can generate an electric signal, which in turn can ionise a column of air above the rock. The ionised column would move through the atmosphere as the source of strain moved underground. And the ionised air can glow, taking on a shape, according to Persinger, similar to that popularly ascribed to many UFOs.

Brian Brady at the US Bureau of Mines in Colorado has put the effect described by Persinger to the test. He subjected quantities of quartz crystal to pressures similar to those occurring in active fault zones in the Earth's crust, and he found that the piezo-electric effect did induce visible ionisation of the surrounding air, just as Persinger predicted.

Persinger has suggested a large number of consequences should his theory indeed be correct. For example, sightings of UAPs should be concentrated around active fault zones; there should be more in hilly terrain; reservoirs with their attendant stresses on the rock should be focal points for the effect; and the passage of masses of air, such as cold fronts, should release any strain that may have built up.

Persinger's hypothesis thus contains what has long been demanded of ufology: a theory capable either of validation or falsification. Neither Persinger nor Brady is a ufologist, but certain UFO reserachers have come to recognise the importance of their work and set about verifying it. Paul Devereux, a British researcher into "Earth mysteries", has recently published the results of his preliminary study (*Earth Lights*, Turnstone, 1982). He attempts to show that there is a significant correlation between active fault zones in Britain and areas where UFOs are most often sighted.

One area that has since 1972 been recognised as a region of many UFO sightings is in the Pennine foothills surrounding Leeds and Manchester, an area that also has a high concentration of active faults. Local inhabitants and police forces talk of a luminous aerial phenomenon, known as the "mystery helicopter" because of its low-level manoeuvrability. (Surprisingly, Devereux found that this was the only area of active faults that did not have a marked number of UFO reports, but this seems to be a result of his patchy methods of obtaining data.)

In research completed this year, one of us (Randles) has shown that the "mystery helicopter" is a typical UAP and has verified in the field a substantial number of Persinger's postulates. For example, the study shows a correlation between levels of sighting and the thickness of quartz-bearing rock; that the most active faults, such as the Craven fracture, tend to produce the most spectacular UFO concentrations in local folklore; that there is a direct association between the lights and the presence of reservoirs; and clear indications that the UAP entails atmospheric ionisation. There are even suggestions that Persinger's idea that weather systems can trigger UAPs might be realistic. This research will be published in *The Pennine UFO Mystery* (Granada) this spring.

It is interesting that Rutledge's study of a hill area in Missouri appears also to illustrate several of Persinger's predicted features. And is it merely coincidence that the two completed studies in the field both revolve around hilly terrain, just as Persinger suggested? We believe that these preliminary

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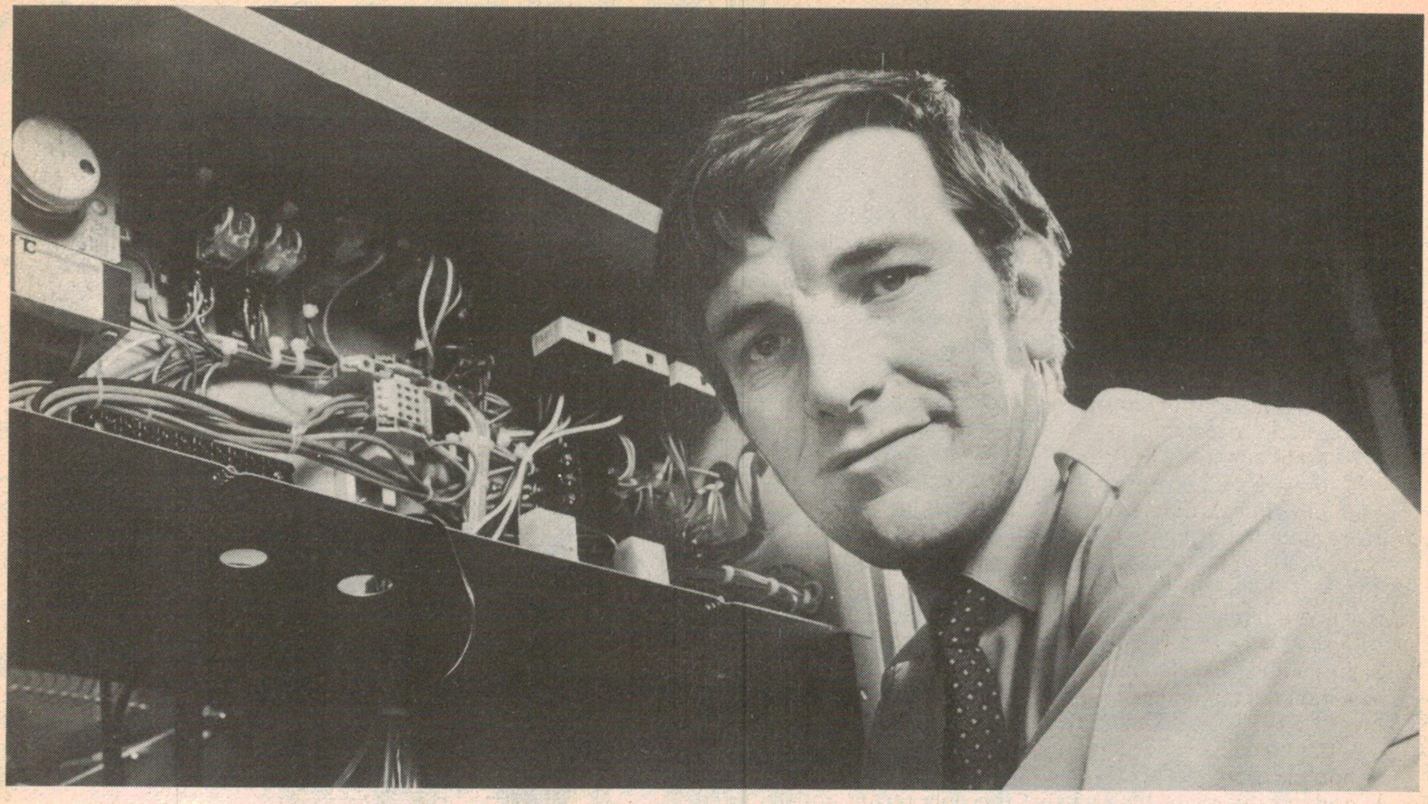

UFO's: Time for rational studies

continued from p33

studies strongly indicate that here, at last, is a valid theory for some UFO phenomena, and that what we have called UAPs can now be tested scientifically.

While this search for a physical basis to the UFO phenomenon has been continuing, there has been parallel research into another aspect. This category is much more controversial and inherently implausible, as it contains the alleged abductions of humans on board a UFO. The abductors are typically described as "alien beings" and the UFO as a "spaceship". Serious UFO researchers have come to recognise that these stories are essentially subjective. Randles, for example, found that while for observations of UAPs the average number of witnesses per sighting was about 2.6, this number fell dramatically for abductions to an average of only 1.3. And the more bizarre the alleged abduction, the closer this figure tended towards 1.0, or total subjectivity.

Persinger has suggested that these reports might be hallucinations instilled into the witnesses by the effect of ionising radiation in close proximity. The work of some UFO investigators has also shown apparent comparisons between the physiological effects of close contact with UFOs and temporal lobe epilepsy. This might support Persinger's hypothesis, as might the fact that the only recent abduction reported in the Pennine area occurred on the Craven fault.

Meanwhile Alvin Lawson, professor of English at California State University, and his colleague, William McCall, a medical hypnotist, have endeavoured to prove whether the details of memories about abduction can be explained purely in terms of the psychology of the percipient. This would be the case if indeed the events were involuntary hallucinations. In their initial work, Lawson and McCall put imaginative individuals, screened for lack of UFO knowledge or interest, into a state of controlled hypnosis. The subjects were then asked to hallucinate a UFO abduction, and the researchers compared the results with memories of allegedly real abductions. They found marked points of similarity.

Latest tests seem to indicate a 100% correlation between certain modes of abduction imagery and the way the subject was born. If born by natural means, the subject's entry into the UFO will never be imagined as by way of a bright explosion of light; if born by surgical means, the entry will never be by transport along a tube or tunnel. Lawson views these methods of entry into the UFO as repressed memories of sudden forced emergence into the world at birth, or of slow travel along the birth canal in the normal way.

Some psychologists still dispute the experiments of Lawson and McCall. They argue that there is no independent proof that an individual is capable of remembering the birth process. But, it remains possible that the imagery is a construct based upon that person's memory (as later told to him) of his process of birth. If this is true then there may be a loophole for the theory; a case where an individual, for some reason or another, such as being abandoned at birth, never discovers how he was born, nor has an opportunity to absorb such information unconsciously while a young child.

We have not intended in this article to prove any specific origin for UFO phenomena, or to appeal to the scientific community for greater respect. But the value of UFO research to science does seem clear. It is a crossdisciplinary topic, offering data in fields as diverse as the psychology of perception, hallucinations, sociology of belief, atmospheric physics, geophysics and several others. That would appear to make it worthwhile for science to be a little more lenient with the serious UFO researchers and their data.

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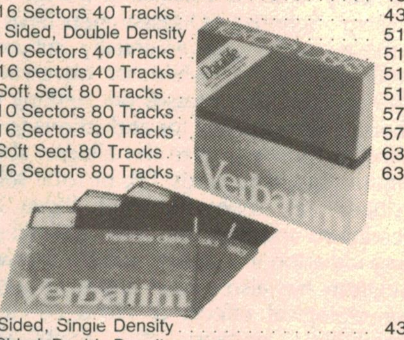

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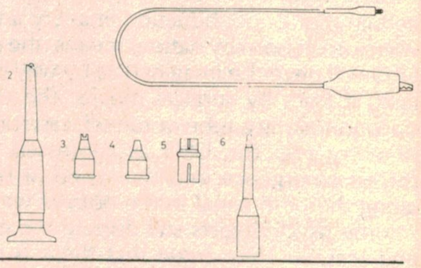

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FORUM

Conducted by Neville Williams

It was nothing like this in "the good old days"!

Once upon a time, faced with a problem in a piece of electronic equipment, one could ring the Chief Engineer at the appropriate factory or accost him at the next meeting of the IREE. But not anymore; the "appropriate factory" is in another country, the Chief Engineer speaks another language and certainly isn't accessible for casual conversation.

Perhaps it's easy to overdo the "good old days" theme but it *was* reassuring to be able to talk directly with the person or the team who had developed and produced a particular line of components, or a particular range of equipment. It was rare indeed for them not to be able to come up with answers to even quite obscure questions about those components or those products. As to the future, they had a good idea of what was in the pipeline.

I remember well the many conferences we had with valve application engineers from AWA, Philips and Mullard about associated circuit problems; with Ferguson and A & R engineers about transformers in overall feedback hifi amplifiers; with AWA engineers about deflection components and circuitry in our home-built TV receivers; and with the team from Stromberg-Carlson during the presentation of our first-ever electronic organ.

THEY HAD THE ANSWERS

One could go on . . . and on . . . citing examples and putting names to the people involved.

Indeed, the initial 30 years of my association with this magazine followed a pattern of asking questions and discovering answers – usually firm answers – almost as a matter of course.

The position began to change during the '70s when the Federal Government effectively decided to abandon local production of electronic components and equipment in favour of imported products. There may have been all kinds of practical and economic reasons for so doing but, inevitably, we stood to sacrifice the detailed know-how that comes only from doing something yourself. No sequence of factory visits, structured lectures or technical manuals can make good such a loss in the long term.

The loss wasn't too obvious at first because engineers, who had been producing components and equipment in Australia, were able to extrapolate their practical experience by means of technical reading. But many of this generation have since lost touch, or been absorbed into other activities, or simply retired.

The new generation of engineers and technicians are having to operate much more in a "production" vacuum. They can acquire formal training, hands-on experience of finished products and fix-it training, but they are almost totally isolated from the subtleties and the problems of in-factory design and production. They miss out on all the incidental considerations which, while clouding the main issue at the time, add immeasurably to one's background.

Involved, as we are, in the production of a technical magazine we, at "Electronics Australia" have been finding ourselves frustrated by the lack of this on-the-spot experience more and more frequently in recent years.

Nor are we alone in expressing this lament. In sounding out contacts around the industry, we found universal concurrence – sorry, complete consensus! Engineers and technical marketing people are acutely conscious of their isolation from the place where the action is. Key Service Department personnel who, in the past, have often been valuable back-up repositories of knowledge, complain that they now get to know products the hard way – after their release on the market.

No longer do they eat lunch in the same canteen as the designers!

The end result is that, in asking questions we often find ourselves ahead of those who, in other circumstances, would already know the answers. To us, as technical journalists, it is merely inconvenient; to the industry as a whole, it is a sorry symptom of our dependence on others.

Let me quote a few examples, more or less as they come to mind:

Around 1977/8, Technics marketing and engineering people in Osaka became aware of the virtues being attributed by hifi buffs world-wide to class-A power output stages. Technics' response was to come up with a new and revolutionary class-A (?) amplifier ("Class A+") which allegedly combined the traditional advantages of the approach with a power conversion efficiency comparable with that of class-B operation.

To anyone like the writer, who had been brought up, in part, in a valve application laboratory, that was a straight-out self-contradiction. A basic tenet of class-A doctrine is that, with the output devices biased at the centre of their working characteristic, power supply drain must be considerable and constant, irrespective of the instantaneous power output. How could a class-A amplifier be anything else but fundamentally inefficient – the traditional bugbear of the mode?

We said as much but it soon became apparent that the argument could not be resolved in Australia. Even in Osaka (see our February '78 issue), we could pursue it only as far as the courtesies of the occasion permitted. I have yet to meet the Japanese engineer who yields to the exhortion:

"Fair go, mate. Don't come the raw prawn!"

If we were unconvinced by their watering down of the traditional class-A doctrine, they seemed no less puzzled by our insistence that it mattered. We were talking about valve conventions; they were concerned with transistors. And, anyway, they and other Japanese manufacturers had qualified the term with "Plus", "New", "Super" and so on!

As you might imagine, this was a rather special occasion: only rarely do we have the opportunity for face-to-face discussion with overseas engineers actually involved with the equipment we are concerned about. Much more frequently we have to work through problems with the help of a local representative and any literature that may be available.

Fair crack o' the whip. Yer dunno whether yer Arthur or Martha!

Last year, for example, we received a news release indicating that the manufacturers of Beta format VCRs had come up with a technique which would allow them to offer stereo audio sound not far short in quality of that available from compact disc. It involved adding two FM carriers to the existing video record/replay system, which a new generation of Beta VCRs would read and decode. Existing decks would ignore the FM signals and derive their audio from the conventional soundtrack, which would be retained for the sake of compatibility.

The news release went on to say that the extra sound carriers could be fitted into an unused guardband that had been retained in the BETA system between the sidebands of the luminance and chrominance signals. It was pointed out (with apparent satisfaction) that the technique would not be possible with the rival VHS system, because no vacant space was available between the sidebands.

MULTIPLE GUESS . . .

When answering a reader's question about the system for the Feb/Mar '83 issue of our companion journal "VideoMag" I originally hazarded a guess that the Beta hifi system would still be some months away, that Beta would join VHS in the interim with conventional stereo, and that VHS engineers would get around the alleged problem of band space, since they would have been working with FM sound for the proposed 8mm industry-standard format.

As matters transpired, before the answer went to press in that form, JVC and Matsushita (National) were reported to have demonstrated a VHS hifi-stereo FM soundtrack, with Sony going temporarily quiet on the idea, while offering conventional stereo sound on their SL-C9. Our preliminary guess had been very close to the mark and we modified our answer accordingly, before publication.

Our remarks were subsequently contested by a prominent local feature writer who told me that he had tried without success, in Tokyo, to locate or verify the supposed demonstrations. In all good faith, he put it down as a "furphy" but my latest information is that VHS hifi is indeed scheduled for commercial release, as also is Beta hifi.

In retrospect, it seems obvious that the two rival camps were playing at their old game of commercial politics, with tactics and leaks – accidental and inspired – no less real than they are in political politics!

Oh to be able to buttonhole the respective Japanese General Managers, or Marketing Managers, or Engineers and, with characteristic Australian courtesy, challenge them to:

"Come clean and quit beatin' around the bush!"

TOO GOOD TO BE TRUE?

About the same time (Dec '82) we received a news release from Pioneer to do with an interesting adaption of their laser video disc system. It mentioned that the disc could currently store up to 54,000 still frames but stated that, by the use of an adapter, it would be possible to provide a combination of still pictures with up to 13 seconds of sound per picture; a shorter period if in stereo, longer if purely speech quality could be tolerated.

While it seemed obvious that such a disc would have to use a memory system for the audio, with rapid load and slow read-out, it seemed a tall order to be encoding 13 seconds of audio in with each single video frame and to be loading it into memory within 1/25th or 1/30th second.

Pioneer Australia were as much in the dark as we were but a couple of Sydney/Melbourne phone calls and telexes to and from Japan shed a bit more light! While the laser video disc, in its freeze-frame format, can indeed accommodate 30 minutes of colour/sound movie or 54,000 programmable still frames, in the SWS form (Stills With Sound), it could typically accommodate 5,400 pictures with sound – still no mean feat. This worked out at a much more likely figure of 1 picture plus sound for each 10 tracks.

So that's the way the news item appeared in the Feb/Mar '83 issue of "VideoMag" and we have heard nothing since to contradict it.

But it's frustrating to have to choose between publishing an item which you think you've got right, and withholding it for an indefinite period until you can establish meaningful contact with a small engineering group tucked away in a large electronics company on the other side of the world.

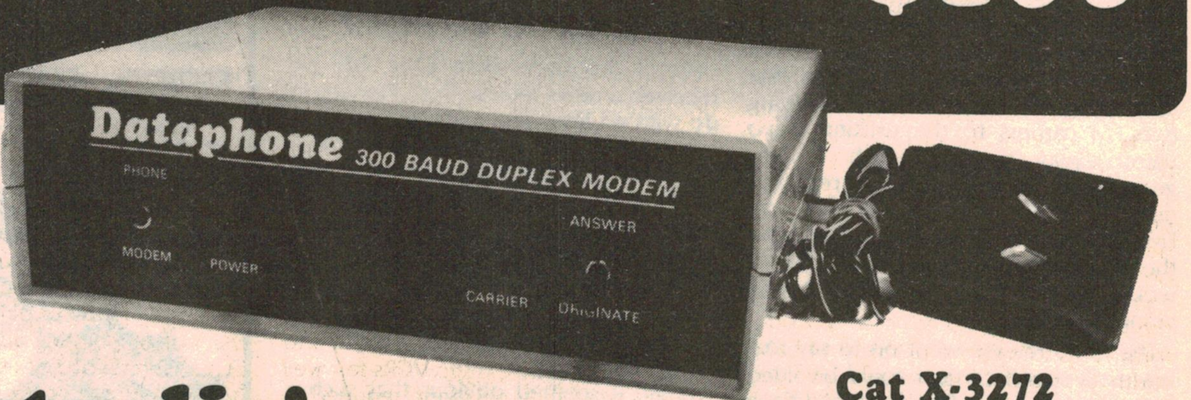
But yer gotta watch yerself though, or yer'll come a gutser!

Still in the realm of home video, our former Assistant Editor, Philip Watson, has recently been working on a story about Supertext captions for television

New Improved Design

Don't pay $400!

Unbelievable price breakthrough: $199



Cat X-3272

Australia's first direct modem to meet new Telecom regulations!

HALF THE PRICE OF OLDER ACOUSTIC TYPES!

The data communications revolution has now reached Australia. More and more personal computer users are communicating with other computers via telephone network, to exchange data and programs with other personal computer users and to access the growing amount of valuable information in the big computer "data bases".

Until now, the only type of telephone modem available for use with personal computers has been the acoustic coupled type. These are expensive, and also depend heavily on the telephone's old-fashioned carbon microphone. As a result even the best units of this type are often not capable of really reliable, trouble-free operation But now, after months of development work and negotiation with Telecom Australia, Dick Smith Electronics presents the Dataphone — a telephone modem that really is suitable for the personal computers. It's not an acoustic-coupled type, but a true high performance direct connect modem. And it's authorised by Telecom. Even more importantly, it will cost you less than half the price of a comparable acoustic modem!

Here are just some of Dataphone's many exciting features:

★ Simple plug-in connections.
★ Full duplex operation for speed and convenience.
★ Operates at the standard data rate of 300 baud.
★ Designed and manufactured in Australia.
★ Standard RS 232C interface—so it can be used with almost any personal computer.
★ Fully complies with both Telecom regulations and CCITT Recommendation V.21 — hence it is not only legal, but also fully compatible with other modems (Telecom authorisation No. C82/37/557).
★ Operates in either Answer or Originate mode, at the flick of a switch, for complete flexibilty.
★ Has a phone/modem switch, for convenient operation.
★ Comes complete with approved power supply and detailed, easy to understand user manual.

DICK SMITH ELECTRONICS

See page 98 for full address details

viewers with impaired hearing. A limited service is already operating in several major population centres, although very few viewers, as yet, have suitably equipped receivers or adapters to take advantage of it.

During the course of conversation, it was mentioned to him that Supertext captions could not be recorded off-air with a normal domestic VCR. The only way that anyone with impaired hearing could record pictures with captions, it was said, was by using the Video Out signal from a Teletext (or Supertext) adapter. Because this provided a composite video signal, with captions superimposed on the picture, it could be recorded on tape in the normal way.

It was an aspect that we hadn't considered to that point in time and we began to speculate as to why such might be the case. Why wouldn't a VCR record and replay video information buried in the frame block, even if in encoded form? Was it mainly a problem of bandwidth or were other factors involved? Did the observation apply to all VCRs, in all locations, or were there exceptions?

It wasn't too hard to speculate as to possible reasons: Teletext (and Supertext) information is more fragile — or demanding — than ordinary picture information, being prone to decoding errors or complete dropout as a result of inadequate bandwidth anywhere in the system (transmitter/receiver/recorder) as well as ghosting and noise at the receiving end.

POTENTIAL PROBLEMS

This being the case, one can hardly be optimistic about the fate of Teletext/Supertext information, after being recorded and replayed on your average VCR. Despite some eminently watchable recordings, domestic VCRs do suffer, as a class, from limited bandwidth, added noise and — if not ghosts — a degree of timing instability.

As well, off-tape information from a domestic VCR usually has to negotiate a modulator and a tuner before reaching the video circuitry of the associated receiver: not a very hopeful path for demanding signals.

It was one thing to suggest reasons but quite another to find confirmation of them. From the responses, it was apparent that, with very few exceptions, local distributors of VCRs and TV receivers had given little meaningful thought to the implications of Supertext. Uncharitably, the situation may change, perhaps dramatically, when Supertext becomes a marketing proposition in Japan and the USA!

But, as if to demonstrate the validity of our basic theme, we did get the information we were seeking from two local sources which are displaying considerable initiative in the field:

- ATN Channel 7 in Sydney, a pioneer in the use of Teletext and, more recently, Supertext.
- The Australian Caption Centre, also in Sydney, established by the Federal Government and maintained by the television industry.

They were able to confirm that Supertext, as encoded in the vertical frameblock, cannot be recorded and replayed successfully on any existing domestic VCR or, for that matter, on any ordinary (low band) U-matic deck. The Teletext/Supertext encoded lines may be clearly visible in the frame block, if the picture is made to roll, but they cannot be resolved by a decoder.

While VCRs may pose individual problems in other respects, the limitation is, first and foremost, one of bandwidth. With a top video frequency limit of 3 to 3.5MHz at best, domestic VCRs fall well short of the 5MHz passband required to cope reasonably with the Teletext/Supertext data — for that's what it really is.

That's basically why, to capture Supertext captions on domestic cassettes, you have to decode the data, merge it with the picture in the normal way and record it all as a composite video image. Hence the suggested use of a Teletext adapter with provision for composite video output.

Which leads us to ask:

- What about a new line of TV receivers with Teletext/Supertext decoders and a composite video output socket for VCR recording?
- What about a new line of VCRs with an in-built decoder to add Supertext captions to the pictures automatically?
- What about VCRs with an optional memory attachment that would slow down the caption data rate for recording and speed it up again for replay in a Teletext receiver?

Those are serious questions which, I suggest, will attract tangible replies when the Japanese and USA markets demand them.

So cop that, young 'arry. Straight from the 'orse's mouth!

Finally, to get away from video, our most recent and frustrating experience with second and third-hand information had to do with the compact disc.

When we set out to present a series of articles on the subject, beginning in the February issue, the information available was very sketchy indeed. Local company representatives did their best to help but it was like trying to assemble a jigsaw puzzle from pieces arriving at random through the mail.

One attribute of the system which seemed least in doubt was that the signal information was recorded in digital form as a spiral of microscopic pits. In all the literature we had seen they were called pits and, in the February '83 issue (page 37) we indicated their length, width and depth, quoted from a Sony booklet.

A footnote about "bumps" puzzled us somewhat at the time but any doubts that might have been engendered by this lone reference were dispelled by statements in Marantz/Philips publications which read thus:

"If, however, the beam falls into a pit on the disc, it is scattered. Very little light returns to the reflective prism and the photodetector."

We were worried initially by that simple reference to the light being "scattered" because it seemed to us that a discontinuity of 0.11μm in a mirrored surface would hardly affect the beam at all. But the Sony booklet set us right on that one by pointing out that a difference in path length of 2 x 0.11μm constitutes a half-wavelength at the frequency of the laser light, producing actual cancellation.

We were also somewhat worried about simplified industry diagrams intended to explain the disc recording and duplication process (May '83, pp 37, 38). With pits of such microscopic dimensions, why were they not substantially filled in by electroplating procedures? We could only guess that this could be offset by complementary dimensional changes during the "positive" and "negative" stages of duplication.

So we stayed with the pits concept.

Imagine our chagrin (the opposite to an ordinary grin) when the instruction manual turned up for the Sony CDP-101 compact disc player. There, in a sketch relating to the compact disc, a detail blow-up describes those microscopic discontinuities in the disc as:

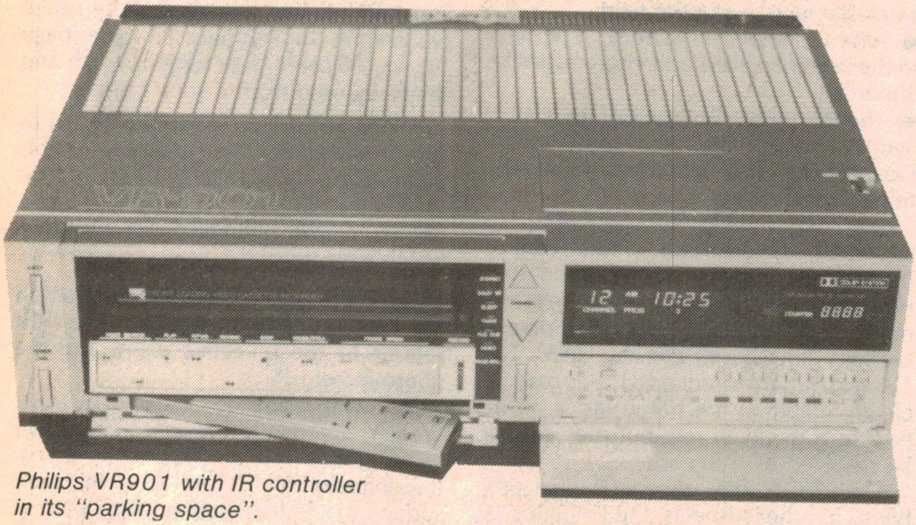
"Pit: Also called bump. Looks like a bump from the reading side."

It doesn't affect the basic theory at all, except that our reference in the March issue to the light having to travel an extra half-wavelength would have to be changed to a half-wavelength less.

In fact, while preparing this item, I have been trying to sort out the role of pits and bumps in the overall recording, duplication and replay process. Does the laser always read bumps in a finished disc or does it see pits in some processes?

People that I've talked to, to date, profess not to have a clue but that's cold comfort when you've presumably got something wrong.

Makes a bloke feel like a bit of a galah!



Philips VR901 with IR controller in its "parking space".

BIG FORWARD PUSH BY PHILIPS

VCRs — video discs — compact discs

At the recent Australian Video Association Convention at Sydney's Regent Hotel, and at an associated press function, Philips were obviously keen to impress upon everyone who attended that the Company was alive and well and active in the area of home entertainment equipment.

As Public Relations Co-ordinator Peter Brownlee remarked, the function was particularly appropriate in Sydney. With much of the Company's manufacturing activity centred in Melbourne, Philips had a fairly high profile in that city. Elsewhere, they needed to push the Company image, against some very active competition from other suppliers.

On show at the Convention was a representative range of Philips home entertainment equipment, including the full range of VCRs, their new compact disc player, and "LaserVision" video disc equipment which awaits only the resolution of marketing and software problems, as they affect Australia.

Philips entry into the VCR market in Australia is no longer news although, at the time, there was some surprise at the choice of the VHS format instead of their own European Video-2000 system. Probably, with VHS and Beta so solidly entrenched here, they could see little advantage in promoting a third — and minority — format.

On this occasion, interest was centred mainly on their new top of the line

by NEVILLE WILLIAMS

model. Buyers would now have the choice of the basic model VR401, the intermediate VR501 or the new VR901 which seemed to score a "yes" (or better) in every square of the obligatory features list.

Whereas the VR401 and VR501 are companion models with fewer or more buttons on otherwise similar panels, the VR901 is very much the big brother with a full range of facilities — the more technical ones normally hidden by drop-down flaps.

As might be expected of a top-range model, the VR901 comes with a cordless infrared remote control unit which combines all the trends which have been evident in other-brand controllers. It not only duplicates the 14 functions on the main control panel but it has them in the same order and with the same markings — except that they are rotated through 90° to allow for the way that a controller is normally held and viewed.

The obvious advantage is that the user can control the VCR with equal facility from the panel or the hand-held unit, without having to remember which layout is which! Furthermore, both are always accessible. If not required, or for storage, the IR controller can be parked in a compartment below the normal controls.

Another simple but sensible feature is that, in both, a single-action Record switch is provided but in the form of a slider rather than a press pad, to reduce the risk of accidental erasure.

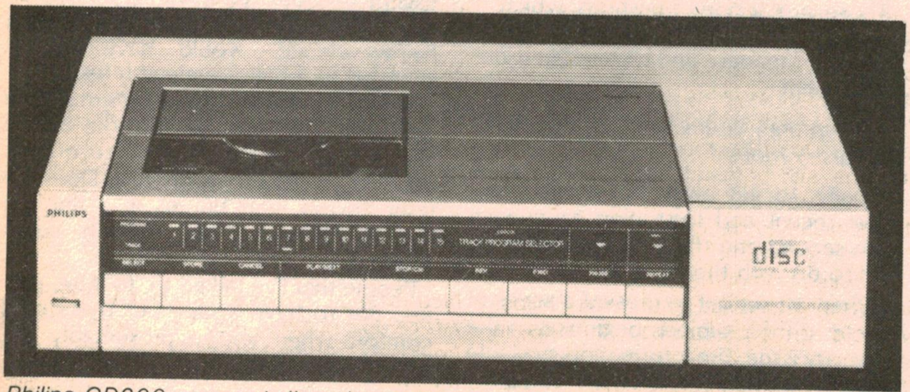
Tape facilities on the VR901 include picture search at 10 times normal speed, forward and reverse, half- and double-speed forward play, noise-free freeze frame and frame advance.

All readouts, including the four-digit counter, are LED displays, for ease of reading in low light conditions. There is an elapsed time indicator and a flashing warning which alerts the user that there is less than seven minutes of tape running time left.

A socket in the front panel provides for direct connection of a camera as, for example, the Philips cameras type VK4100 and VK911. In addition, a full stereo sound system is provided, with switchable Dolby noise reduction and twin microphone inputs.

As with the other models, they arrive "factory tuned" for the channels in each consumer area and displaying the appropriate channel numbers.

Philips stress that the VR901 is backed by their own nation-wide service



Philips CD200 compact disc player. It is currently on sale in Australia for $999.

network. It is available from Department and Electrical stores nationwide and carries a recommended retail price of $1299.

First release in the Philips range of compact disc players is their CD200, a slimline top-loading model which carries a recommended retail price of $999.00. It is currently being demonstrated in selected retail outlets, using a display that is intended to set it apart from conventional audio/hifi components.

Mike Orvis, Group General Manager, Philips Consumer Products, said that he expected the units to be snapped up initially by audio buffs but that Philips would be monitoring sales to determine whether CD players also have an appeal to the mass market in Australia.

"This has been a significant trend in Britain," he said.

"CD players are being bought by average people interested in good music.

"In Japan and Europe, the market has spread well beyond the dedicated audiophile."

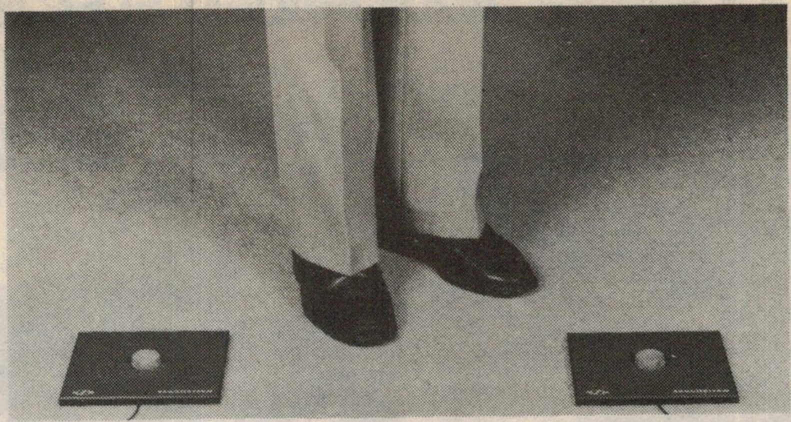
Mr Orvis estimates the Australian market at a minimum of 20,000 units in its first 12 months, despite some initial supply problems that are affecting all suppliers.

"Overseas markets have proved very much larger than anybody anticipated. Production facilities in both Japan and Europe are being massively expanded but it must take some time yet before supply will anywhere near match demand."

Promotion of the compact disc has been tied in with Philip's sponsorship of the Australian Opera's production of "La Traviata". A recording of the opera featuring Luciano Pavarotti and Joan Sutherland on compact disc is being used to demonstrate the system.

Luciano Pavarotti's reaction to the recording was: "I think it is the most perfect thing I have ever heard in my life . . . I think it is very faithful."

He joins a group of others like Herbert von Karajan, Neville Marriner, Sir Georg Solti, Abba, Barclay James Harvest, Kool & The Gang, and the Statler Brothers, who have spoken out publicly in favour of the technology.



Please don't walk on the microphones!

Sennheiser have introduced a new type of microphone into their already extensive range. You don't support it on wires above the sound source. You don't attach it to any kind of adjustable microphone stand. You simply place it on the floor and do your best to keep people from walking on it!

While microphones on stands are usually visible enough to be noticed and avoided, they do have one significant drawback: when used at – say – a metre or more from the sound source, phase interference occurs between sound waves reaching the microphone directly and those reflected from the floor. It tends to produce ripples in the effective frequency response of the microphone, as well as compromising the phase information in any signal being recorded.

Where practical, the phase interference can be minimised by placing the microphone very close to the floor, although disturbances in the acoustic wavefront can still occur, due to the very presence of the microphone assembly on the otherwise plane surface.

The concept finds logical expression in the so-called PZ or Pressure Zone microphones in which a small high-quality electret capsule is mounted in a flat, plate-like housing, with the diaphram flush with the surface. The effect on the sonic wavefront is thus substantially reduced, even if not minimised.

Sennheiser's new PZ type microphone, described as the "Acoustic Boundary MKE 212" makes use of their existing miniature condenser capsule KE 4, having a diameter of only 4.75mm. This is embedded in a solid plate, with a 5mm sound inlet hole, flush with the surface. It is normally protected by an acoustically transparent microphone basket but nevertheless causes minimal disturbance of the wavefront.

Sennheiser claim that a pair of MK 212s give particularly good stereo imaging. In free space they have a pressure step at about 1kHz but, when placed on the floor or other large plane surface, the pressure increment is moved to a very low frequency. Two versions of the microphone are available, differing mainly in the power supply provisions.

The MK 212 is now available in Australia and inquiries may be directed to Sennheiser stockists, to R. H. Cunningham state branches or direct to R. H. Cunningham Pty Ltd, 146 Roden St, West Melbourne 3003. Phone (03) 329 9633.

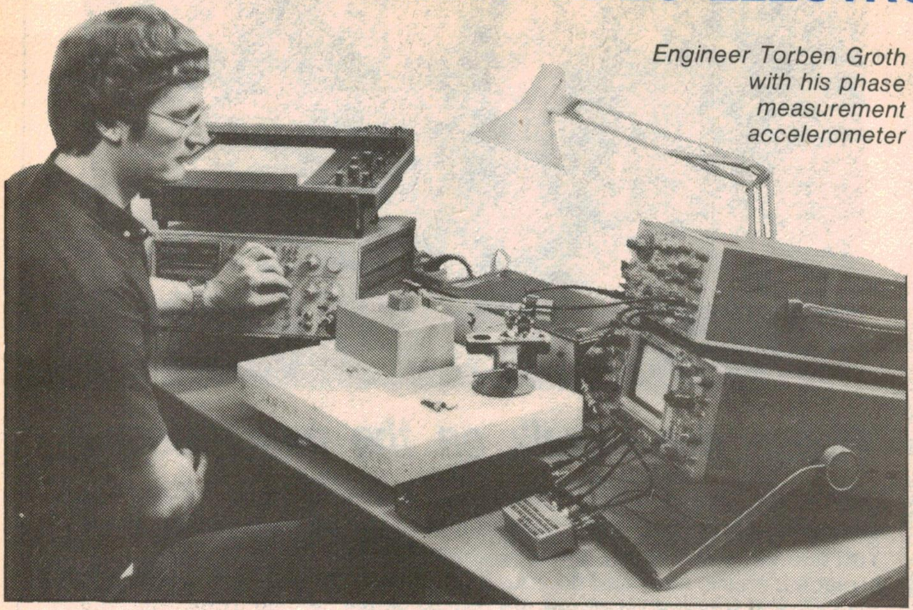
As to the future of the LaserVision video disc system, the technology and potential is well established. However, as with other video disc systems and other manufacturers, Philips have to be sensitive to the marketing situation which is still dominated by the video cassette recorder — another one-time Philips initiative, dating back to the early '70s.

What lies somewhere up ahead is indicated by a press release from Philips, available at the convention. It reads, in part:

CBS/Fox Video (UK) has finalised a multi-million pound deal with Philips International to supply over half a million video discs world-wide for its LaserVision system.

Drawn from the existing CBS/Fox Video catalogue and due to include titles scheduled for release in future months, approximately 100 of the Company's movies and specialist programs will be purchased directly by Philips over the next year for distribution in the UK, West Germany, Scandinavia, The Netherlands, France, Australia, South Africa, Hong Kong and Singapore.

Philips is pledged to take over half a million video discs from the joint venture.



Engineer Torben Groth with his phase measurement accelerometer

Ortofon M/C super-cartridge

For 30 years or more, audio buffs seem to have been arguing about the relative merits of moving coil phono cartridges, compared with their moving magnet counterparts. Ortofon claim recently to have found the answer, while researching a new design.

by NEVILLE WILLIAMS

With almost religious fervour, one group of audiophiles has insisted that moving coil cartridges, as a class, possess a certain "sweetness": plus an ability to reveal sonic texture and detail that is not exhibited by the moving coil types.

Those who do not share this view have tended to put it down to imagination, pointing to measurements that seemingly indicate that, dollar for dollar, the moving coil principle offers no apparent advantage. On the contrary, moving magnet types may often be shown to produce the better figures.

While Ortofon manufacturing A/S of Copenhagen, Denmark may have some stake in the argument, as pioneers of the MC (moving coil) principle, they are in a favourable position to research the matter; possessing a high level of experience and expertise, they manufacture and market a range of both types.

Conventional tests indicate that, as a rule, MC cartridges have a better response in the supersonic region, commonly extending out to about 50kHz. MM (moving magnet) cartridges, on the other hand, tend to roll off around 20kHz. However, the Ortofon team was not satisfied that the difference was simply a matter of frequency response, or that conventional test procedures were even capable of shedding light on the subjective observations.

The matter became really critical when an experienced Ortofon "Golden Ear" listening team identified problems in pre-production samples of what was hopefully destined to be a super-quality Ortofon moving coil cartridge. They were able to sort the prototypes into three groups which sounded good, not-so-good and disappointing. Yet, on test, no apparently significant differences were discovered in the usual range of parameters.

It so happened that Ortofon Development Engineer Torben Groth, had some time previously prepared a thesis on the audiblity of phase distortion in loudspeakers and he became convinced that phase rotation could be at the root of the observed differences between the prototype cartridges. The problem was how to quantify it.

Ortophon already had in their possession a test disc which could supposedly be used for phase measurements, but Groth found that the measurement accuracy available was quite inadequate for his purpose.

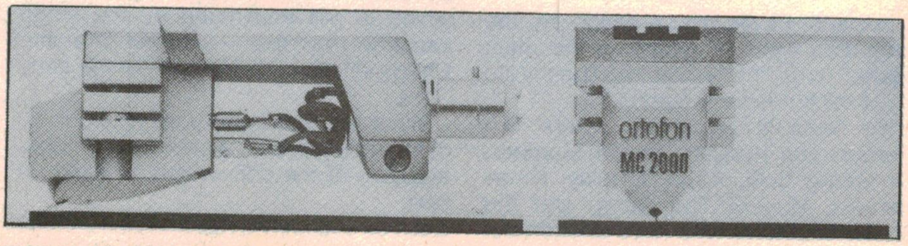
He therefore set about to produce a vibratory driver — an accelerometer — on which the stylus tip could rest, with the cartridge supported in a normal arm to simulate standard playing conditions. The accelerometer was driven by a pulse generator, with a Hewlett-Packard 3582A spectrum analyser to display and interpret output from the cartridge, in terms both of phase and amplitude.

The curves on the screen were most convincing but Groth had no sure way of separating the characteristics of the cartridge from those of the test equipment.

In an effort to do so, he sought the assistance of the Danish Riso Nuclear Research Station, which is actually a centre for quite wide-ranging basic research and theoretical studies. Based on an established cartridge with a well known amplitude response, a mathematical model was devised taking account of all the moving elements. These were fed into a computer to determine the Eigenmodes (resonance frequencies), which were subjected to further calculations to take account of such things as cantilever damping and record material stiffness.

From these data, it was possible to develop amplitudes and phase plots for the frequency range up to 50kHz, which closely approximated measurements of the same cartridge made on Groth's accelerometer equipment. With the equipment thus validated, he was able to proceed to the next step.

This involved correlating the measurements with the subjective sound quality of the prototype cartridges, which had previously been judged as good, not-so-good and disappointing. It became plainly apparent that the best sounding cartridges were not those with the flattest frequency response or, for that matter, with the most linear phase response. It appeared that excellence in one characteristic had been realised



The Ortofon MC 2000: a machined aluminium housing in a magnesium headshell.

SIXMIX

EUROPEAN SIMPLICITY

The Sixmix Mark I, 6 in/4 out mixing console offers affordable multi-track mixing capabilities, with professional features and performance. Designed for small studio requirements, audio visual presentations and sound reinforcement systems.

Its multi-patching possibilities and ergonomic design make this Dutch console an ideal tool for the serious artist.

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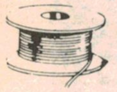
ENAMELLED WINDING WIRE

Handy hobby packs — for coil winding etc.

	Metric	B + S	Pack	Price $	10 Up $
W 0402	.2mm	32	25g	2.95	2.50
W 0403	.25	30	25g	2.95	2.50
W 0404	.4	26	25g	2.95	2.50
W 0405	.5	24	100g	2.95	2.50
W 0406	.63	22	100g	2.95	2.50
W 0407	.8	20	100g	2.95	2.50
W 0408	1	18	100g	2.95	2.50
W 0409	1.25	16	100g	2.95	2.50

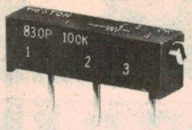
TINNED WIRE PACK



.63 mm/22 g B&S 100g Pack
W 0420....... $2.95
10 up... each $2.50

MULTI-TURN TRIMMERS

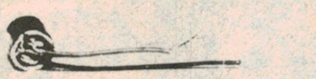
INDUSTRY PREFERRED TYPE



ALL ONE PRICE
$1.95
10 up...... $1.80

Resistance	Cat	Resistance	Cat	Resistance	Cat
100 R	R 2410	5 K	R 2423	200 K	R 2433
200 R	R 2415	10 K	R 2425	500 K	R 2435
500 R	R 2417	20 K	R 2427	1 M	R 2437
1 K	R 2419	50 K	R 2429	2 M	R 2439
2 K	R 2421	100 K	R 2431		

MIC INSERT ELECTRET



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SPECIFICATIONS

• Vertical deflection	
Sensitivity	5mV div to 5V div ·5%, 10 calibrated steps 1mV div to 1V div ·6% (When using x5 amplifier) Uncalibrated continous control between steps 1 · 2.5 (provided with click positioning function)
Bandwidth	DC to 15MHz, -3dB (at 4div) DC to 7MHz, -3dB (at 4div) (When using x5 amplifier)
Rise time	24ns, (for x5) 70ns typ
Signal delay line	
Max. input voltage	600Vp-p or 300V (DC · AC peak, at 1kHz)
Input Coupling	AC, GND, DC
Input impedance	Direct 1M ohm, approx. 30pF
Operating modes	CH1, CH2, DUAL, ADD, DIFF
X Y operation	CH1 X axis, CH2 Y axis
Sensitivity	5mV div to 5V div (when using x5 amplifie. 1mV div)
Phase difference	DC to 10kHz within 3
X bandwidth	DC to 500kHz, -3dB
Dynamic range	4div or more
CH1 output	
Output voltage	20mV div or more (terminated into 50Ω)
Band width	50Hz to 5MHz -3dB
Output impedance	Approx. 50Ω

• Horizontal deflection	
Trigger modes	AUTO, NORM, TV (+), TV (-)
Trigger source	CH1, CH2, LINE, EXT
Trigger coupling	AC
TV sync	TV sync-separation circuit
Internal	1div or more (V sync-signal)
External	1Vp-p or more (V sync-signal)
Trigger sensitivity	Frequency / Internal / External: 20Hz to 2MHz — 0.5div — 200mV 2 to 15MHz — 1.5div — 800mV
AUTO low bandwidth	30Hz
Trigger slope	·
External trigger input	Input impedance approx. 1M ohm, 30pF or less Max. input voltage 100V (DC + AC peak, at 1kHz)
Sweep time	0.2µs/div to 0.2s/div ·5%, 19 calibrated steps Uncalibrated continuous control between steps 1 · 2.5 (provided with click-positioning function)
Sweep time magnifier	10 times (·7%)
Max. sweep time	100ns/div (20ns/div and 50ns/div, not calibrated)
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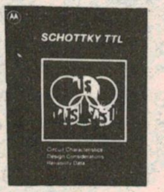

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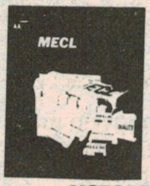

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at the expense of the other and that optimum results might involve a deliberate trade-off between the two parameters.

The tests underlined the fact that a phono cartridge is not an inherently linear transducer and that there will always be resonance frequencies in the moving system. Furthermore, it cannot be taken for granted that a linear frequency response equates to a linear phase response.

Resonance effects can be countered by damping, to the point where frequency response becomes substantially flat — but the resonance will still show up in the phase response. It is thus possible to end up with an almost flat frequency curve but a far from optimum phase characteristic. Conversely, preservation of a good phase characteristic can be at the expense of a too-obvious peak in the frequency response.

In the ultimate, the best sounding cartridges did indeed turn out to be those well removed from either extreme: typically exhibiting an acceptable phase response, together with a frequency response rising about 1dB at 20kHz and with an ultimate resonance peak in the supersonic region of between 3 and 5dB.

Measured over the audible range, this emerges as a virtually linear phase characteristic, combined with a frequency response that shows only insignificant departure from the ideal. Ortofon claim that it is this combination of good frequency response and good phase response over the audible range that makes it possible for cartridges "to produce a sonic picture with an excellent illusion of source acoustics and no noticeable sound colouration".

RESONANCE PROBLEM

Ortofon point out that moving magnet cartridges have a special problem in that their normally high-output, high-inductance coils tend to involve electrical resonance effects within or adjacent to the audible range. It is possible to compensate for this deficiency by the mechanical construction of the magnet and cantilever assembly but, even though the frequency response may end up as "ruler flat" over the audible range, the phase characteristics resulting from the interacting resonance effects could be anybody's guess.

Moving coil cartridges, on the other hand, normally have low impedance coils with electrical resonance well out of the way, in the megahertz region. All other things being equal, low impedance moving coil cartridges will

The composer is easy to Handel. Simply Liszt the notes you want, then show Orff to your friends by playing them Bach!

Sharp (and flat) music system!

The Sharp Corporation has released a portable sound centre on the Australian market, guaranteed to bring out the best in any budding musician. For would-be composers, the traditional music world of quavers and crotchets has taken a new meaning — with the assistance of technology and audio innovation.

Sharp believes its GF 990 Music Processor is a world first combination of radio cassette, electronic organ and computer technology — packaged in one low-priced fun portable product.

The GF 990 allows you to create music without having to play an instrument or interpret notes. And with its AM/FM radio and double cassette facility, the music processor doubles in its entertainment capabilities.

The music processor has a compact keyboard-like device on which all necessary information is keyed in. Once the key is set, position and length of notes and chords are inputted one by one, just as those written on sheet music. The built-in microcomputer memorises data so that with the press of a button, the sound can be played back — complete.

As a further bonus you can record your own voice with the electronic organ and then re-record over and over until one person ends up as a group! The rhythm, tone and melody can be programmed to create music for fun, perhaps profit or even a sound track to a video home movie.

According to Sharp's product manager audio, Arthur Hodge, the electronic keyboard in the music processor is what makes it fundamentally different from other portable sound systems.

"If you can't play a note or even sing a song, the technology in the unit will help you. By following a simplified operation sheet, which is supplied, you simply punch the notes into the electronic keyboard. You do this by pressing the desired note and then indicating by pressing another button whether it is a full note, half note or quarter note and whether it should be sharp or flat. It's as easy as dialling a telephone."

When the tune has been loaded into the keyboard's own memory band, in digital form, you simply press the Play button and the unit replays the tune for you, automatically. However, you may want to record it permanently on cassette or even add your own voice. All you do is start the keyboard playing the tune and sing along with it. The cassette recorder mixes the two and puts it onto a standard tape. And if your voice leaves a lot to be desired the built-in echo-unit will help you out!

Features of the GF 990 include: 36W output (total peak music power; double cassette mechanism for easy editing; high-speed tape-to-tape transfer with one-touch start; detachable two-way loudspeaker enclosures; five-band graphic equaliser; automatic five-program locate/pause system; metal tape capability.

The GF 990 is priced at about $750. Information from Sharp Corporation stockists around Australia or direct from The Sharp Corporation of Australia, 64 Seville St, Fairfield 2165. Phone (02) 728 9111.

therefore tend to have the advantage in terms of phase linearity — which could be what hifi buffs have been hearing!

Ortofon say that the results of this most recent research will be applied to all future moving coil cartridges. As well, they will be looking more closely at the design of their VMS series moving magnet cartridges to see whether the findings can be applied to advantage. For example, can they be redesigned for lower capacitive loading in order to achieve a major improvement in phase linearity for a minor digression in the frequency curve?

And what of the new top-of-the-line moving coil cartridge, to which the research was originally directed?

It will have been released in Australia as the "Ortophase MC 2000". Ortophon say that, over and above the matter of frequency and phase response, everything about it has been re-examined or re-designed. It features:

- A new miniature SCL (Single Line Contact) diamond stylus;
- An effective stylus tip mass of 0.27mg;
- A super lightweight aluminium armature, wound with silver wire;
- Samarium cobalt magnet giving a 2.6-times increase in magnetic field strength;
- Vertical/horizontal compliance figures of 20/20 μm/mN — the highest ever for an Ortofon MC cartridge;
- Tracking ability at 315Hz, at recommended tracking force, of 100μm;
- tracking force of 15mN or 1.5g.

The "works" of the MC 2000 are housed in a casing machined from a solid aluminium block. While it can be fitted into a normal headshell, Ortophon would much prefer that it be used with their own special headshell, produced especially for the cartridge. Manufactured from magnesium, it is claimed to have smaller vibration modes, more effectively damped than normal shells.

And how much will the MC 2000 cost? A cool $1300!

If that's in your league and you want to know more about the MC 2000, inquire at any Ortophon stockist or direct from the Australian distributors: Vanfi (Aust) Pty Ltd, 297 City Rd, Sth Melbourne 3205. Phone (03) 690 6200.

TEAC marketing DENON tapes, cassettes

TEAC Australia Pty Ltd have announced their appointment as Australian distributors for the DENON range of cassette tapes and open-reel tapes. Denon is one of Japan's leading tape manufacturers, and notable for their comprehensive product range. TEAC are planning to market the full range through audio stores across Australia.

A handsome colour brochure accompanying the announcement illustrates the current range of compact and microcassettes, lists their characteristics and pictures the manufacturing process. Included in the compact cassette range are the following types:

LX: budget level, general-purpose ferric cassette for normal bias. Available as C-46, C-60 and C-90. Other cassettes in the range are normally available only in C-60 and C-90.

DX1: standard, normal bias ferric tape, with excellent characteristics, self-cleaning leader and quality housing.

DX3: also for normal bias but using a double layer coating for improved response, dynamic range and reduced noise. Precision housing, self-cleaning leader.

DX4: double coated and offering the highest performance for a standard bias tape. Precision housing, self-cleaning leader.

DX5: double ferric coated for high bias (Type III, FeCr) offering wide dynamic range and low distortion. Precision housing, self-cleaning leader.

DX7: the ultimate high bias DENON cassette with double, cobalt-doped layer. Precision housing self-cleaning leader.

DXM: metal coating, using special binder and offering the ultimate cassette performance. "Metal" bias, precision housing, self-cleaning leader.

Two microcassettes are available, the standard ferric coated MC-60DX1 and the high performance metal coated MC-46DXM, for possible music recording.

For details, contact Geoff Brown, Sales & Marketing Manager, TEAC Aust Pty Ltd, 115 Whiteman St, South Melbourne, 3205. Phone (03) 699 6000.

Sharp Receiver/Monitors

Of considerable potential interest to readers of this magazine is the recent release in Australia by the Sharp Corporation of three new TV receiver/monitors. While all three have an obvious role for television viewing, they also have provision for direct video and audio input signals from units such as VCRs, video disc players, cameras, video games and home computers.

The vast majority of domestic TV receivers to date have been designed on the assumption that their prime role will be to receive signals from television broadcast stations, by way of the antenna socket. The incoming "RF" carriers are selected and amplified by the tuner and IF systems before being demodulated to recover the wanted video and audio components to feed the picture and sound circuitry.

No direct access has been provided for video and audio signals, partly because it seemed unnecessary, and partly because it would have posed special problems in the many receivers which have a "live chassis" type power supply.

With the development – and the rapid acceptance – of VCRs, video games and home computers, the manufacturers of these devices had to come up with a way of feeding their video and audio signals into existing domestic TV sets – of necessity, via the antenna/tuner system.

Their answer has been in the provision of a "modulator", which imposes the video and audio information on RF carriers which the TV set can receive on a normal but (locally) unused channel. The most common options in Australia are channels 0 or 1, 3 or 4, or UHF channels 30-39.

The idea works reasonably well in practice but it is nevertheless open to criticism: the RF link can be a source of needless RF interference and noise, can limit bandwidth, and can introduce residual non-linear distortion due to the inevitable imperfections of modulation and detection. A video system would obviously be better off with a more direct system of signal feed.

In fact, this need is being recognised in the current overseas trend towards "component" systems, where an off-air tuner, cable source, VCR, disc player, etc, is being used in conjunction with one or more video monitors, possibly including a large-screen projection system. A video switcher is used to direct the desired signal to the monitor(s) and the accompanying audio to the appropriate hifi system.

The new monitors announced by Sharp are on a much less pretentious scale than this but they are a step in that direction. They can be used for normal off-air TV reception but they also have access sockets and switching which enables them to be used as genuine video/audio monitors. Their styling is also consistent with this additional role.

The portable CX-6003, operating from mains, 12V DC or battery pack.

GO-ANYWHERE PORTABLE

The smallest and most eye-catching of the group is the "go-anywhere" portable receiver/monitor model CX-6003. Provided with a pull-up carry handle and an in-built metre-long telescopic whip antenna, it can operate directly from a 12V car or boat electrical system at a drain of 17W. With a clip-on rechargeable battery pack, it becomes completely portable and self-contained. For use in the house or hotel/motel, a clip-on mains supply adaptor can power the receiver for long periods or recharge the battery.

(The 12V extension cord and the AC power adaptor are supplied with the receiver, but the rechargeable battery is an optional extra.)

Priced at around $500, the CX-6003 has an obvious potential appeal for the frequent traveller, who simply wants a compact go-anywhere portable TV receiver. While the 13cm (diagonal) screen is smaller than one might otherwise choose for relaxed viewing of detailed scenes, it is very practical in confined viewing areas.

As a monitor, the CX-6003 does not fit the role envisaged earlier. Its screen is too small and, more than that, the size of the phosphor colour rectangles relative to the screen dimensions set a severe limitation on the ultimate resolution of detail. While sufficient to watch a TV

The DV-1400X 34cm receiver/monitor with IR remote control.

drama, it would scarcely be adequate for the display and critical evaluation of quality TV images.

Despite this, however, a CX-6003 would be a valuable acquisition for an itinerant video camera buff. At present, a video photographer often has to rely on what he can see in real time or in replay on a 25mm monochrome tube, viewed through the camera eyepiece. The balance and impact of the colour in a picture of more practical size is impossible to judge.

ON-THE-SPOT MONITOR

With a CX-6003 on hand, a video camera enthusiast can replay cassettes and even monitor shots in colour, particularly if working out of, or close to a car or a boat. While we did not go through the motions of actually doing so, we did replay some of our existing home-movie cassette shots on the unit and were agreeably surprised as to how much detail, as well as colour information came through on the small screen.

This impression was confirmed by examination of broadcast test patterns, which looked particularly clean and sharp, with excellent geometry inside what is actually a completely rectangular mask.

One point we did note was that, in comparison with other available receivers and a white balance indicator, the image contained a trifle too much red. Sharp will need to be meticulous in setting the colour balance in units that are likely to be used as monitors for video photography.

Changeover from off-air TV to the monitor function is effected by a slide switch at the right/rear of the receiver, while the video and audio input sockets are in the same general area. But, as well, the CX-6003 carries video and audio output sockets – all of the so-called RCA variety. This means that the unit can be used in a still further role as a TV tuner, either for a monitor with no off-air facilities of its own or, more likely, as a companion tuner for a portable VCR, whether VHS, VHS-C or Beta.

As a tuner, the CX-6003 offers the choice of nine preset channels, VHF and/or UHF, selected by up/down buttons on the front panel, with the active channel indicated by an illuminated LED alongside the appropriate number.

The pre-setting of channels is a completely automatic electronic search function, with the buttons being housed under a flap on the top right-hand edge of the cabinet. It is a particularly simple routine provided one can identify the individual channels in some way – familiarity, a copy of the programs, or another receiver for direct comparison.

Typically, one might start with number 1 indicated on the front panel. To allocate TV channel 0 to that position, the "Search Up" and "Search Down" buttons under the flap are manipulated until the receiver locks on to the desired signal. To store it in memory, merely switch to another number on the front panel, as one would do anyway, in setting up for several channels!

Incidentally, preset controls for contrast, colour, brightness and vertical hold are accommodated under the same flap as the channel preset adjustment.

Checked in a good/average suburban location, off-air performance proved excellent with the whip antenna, on all channels from the very low frequency VHF channel 0 to UHF channel 28. With an outdoor antenna plugged in, the signals were clean and noise-free.

PHYSICAL DETAILS

Physically, the CX-6003 measures 179.5(W) x 125(H) x 277(D)mm, and weighs 3.1kg. The AC power adaptor would add about 48mm to the depth and 1.1kg to the weight, much the same observation applying to the clip-on rechargeable battery. The finish is a grey body shell, with black front panel and clear plastic cover, and a black "technical" section at the rear. Audio output is 0.8W to an in-built 8cm diameter round loudspeaker.

All told, a very eye-catching product and a very useful one.

The other two monitors, DV-1400X and DV-1600X, are quite different in concept and presentation from the readily portable CX-6003, being intended for use in fixed domestic or commercial/industrial situations, operating from the power mains only. They are alike in styling but differ in the size of picture tube and in overall dimensions.

Our judgment of performance is based on the smaller of the two, the DV-1400X, which was supplied to us for evaluation. We could easily have had the larger receiver as well but were prepared to accept it as per brochure. Too much equipment in a small space at the one time can become an embarrassment!

The DV-1400X has a 34cm (diagonal) picture tube, described by Sharp as "Linytron Plus, High Focus with Black Borderline Stripes". It provides a crisp, bright image which we judged, in this set, to be very slightly on the "warm" (plus red) side.

In terms of styling, the DV-1400X has a silver-grey plastic rectangular body shell, with a dark mask, faceplate and a dark, tapered rear section. It has about it a somewhat technical/monitor look, without being out of step with domestic expectations. The limiting dimensions are given as 390(W) x 393(H) x 380(D)mm and the weight as a manageable 13kg.

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SHARP RECEIVER/MONITORS — continued

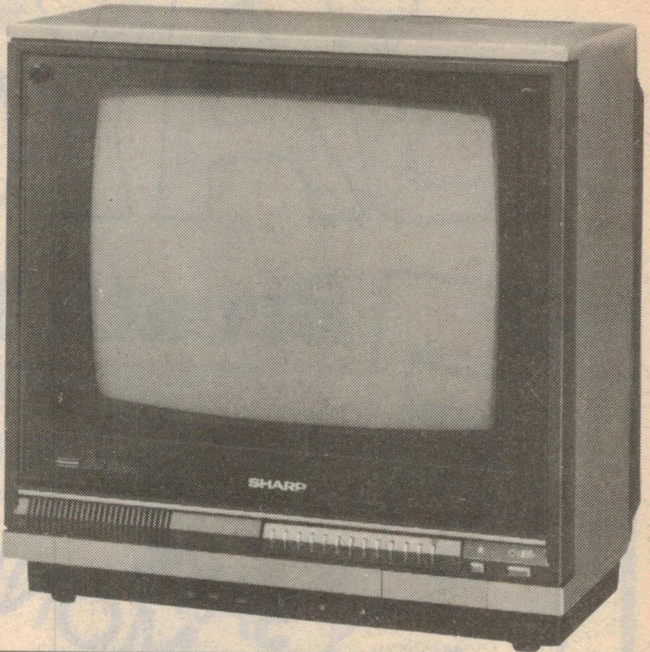
As a receiver, the DV-1400X would best be described as a compact up-market design for compact viewing situations. Of special note is a 13 touch-button control assembly, which normally nestles in the front panel just below the faceplate. However, it pops out readily to become a completely self-contained hand-held infrared control unit providing a selection of 10 TV channels, volume up-down, and mains power on-off.

The channel selected at any time is indicated by an illuminated number just below the screen while knobs below the lower lip of the front panel provide for adjustment of contrast, colour, brightness and picture sharpness – the latter presumably a video peaking facility. The preset tuner adjustments, beneath a flap in the top of the body shell, comprise the now-traditional 10 little sliders and 10 little thumbwheels. All Australian channels, VHF and UHF, are provided for.

The DV-1400X is supplied with a telescopic "rabbit ear" antenna system which fits into a swivel base at the rear top of the body shell. Alternatively, and preferably, an outdoor antenna can be used, with the normal coaxial antenna socket. Either way, at the test site, the DV-1400X performed very well, with the infrared controller being a boon to the weary viewer. The one requirement is to gain a little practice with the volume up-down buttons to avoid the extremes of a full bellow or complete silence!

For its role as a monitor, the DV-1400X can be switched to external video/audio input by a further knob below the lip of the front panel. This isolates the tuner but leaves all the other presets functional, along with the volume control and power switching provision on the infrared controller.

A BNC socket for direct video input is provided at the right rear of the body shell, along with two RCA type audio inputs. These actually merge internally into a common signal for the in-built 2W amplifier and 8cm round loudspeaker, allowing the DV-1400X to be used as a composite video/audio monitor. However, in many cases, the audio would be better taken to an external hifi amplifier system.



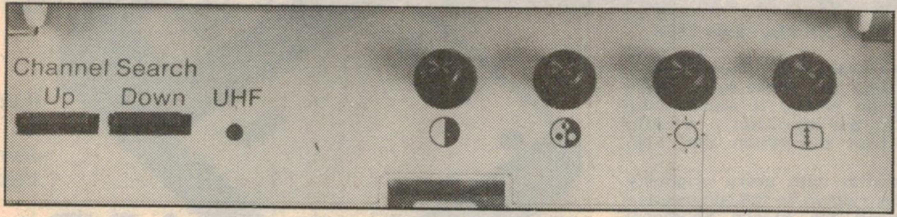
Although the DV-1600X has precisely the same styling as the DV-1400X and similar performance it uses a chassis with fewer but more sophisticated ICs. While currently the largest receiver/monitor in the range, at present, Sharp say that they will be adding larger screen sizes in the coming months, adding up to a complete line of receiver/monitors.

There is no provision for video/audio output, as in the CX-6003, and therefore no idea that this larger receiver/monitor would ever be required as a simple tuner.

Because of the RF/video switching, it is possible to connect a VCR to the DV-1400X simultaneously via the antenna and video sockets and to do an A-B test of off-air signals via the two paths – including test patterns, of course. Programs off tape can be compared in the same way.

It would be wrong to suggest that the difference between the two was glaring; it wasn't. It would be right to say that the difference always favoured the direct video connection in terms of definition, residual noise and picture stability. It could hardly be otherwise!

One thing we did do with the DV-1400X was to turn it over to our resident computer writer, Peter Vernon, and invite him to couple it up to various "micros" that we had on hand, colour and otherwise. Possibly because the average microcomputer modulator is less adequate than its counterpart in a VCR, his verdict was resoundingly in favour of the direct video connection. In the worse case: "the difference between a noisy, unstable, black and white pattern, and good, steady colour!"



The preset controls for the CX-6003. From right: vertical sync, brightness, colour, contrast. The automatic channel search (left) is the simplest we have seen to date.

In all cases, the resolution of the 34cm colour screen was more than equal to the computer characters and graphics, which is not surprising, considering that most domestic and hobby-level microcomputers assume the use of a domestic TV receiver or a receiver-type display unit. In the case of the DV-1400X, the direct video input comes as a distinct bonus.

In summary, our experiences with the DV-1400X confirmed our initial judgment: an up-market compact receiver/monitor for compact viewing situations. If that is what you are looking for, you won't haggle too much about the price of "around $560".

With a screen size of 38cm diagonal, the DV-1600X offers a useful increment in picture size with, of course, some increase in overall dimensions. These are given as 434(W) x 423(H) x 415(D)mm, with a weight of 16.5kg. Sharp point out that the width of the DV-1600X allows it to be grouped in a rack with the latest generation of VCRs and audio equipment, which also measures 43cm wide.

For the rest, general layout, controls and facilities are identical with the DV-1400X. Unfortunately, the extra centimetres cost money and Sharp quote the price as "around $650".

Further details of the three new receiver/monitors can be obtained from Sharp Corporation stockists or direct from Sharp Corporation of Australia Pty Ltd, 64-72 Seville St, Fairfield, NSW 2165. Phone (02) 728 9111. (W.N.W.)

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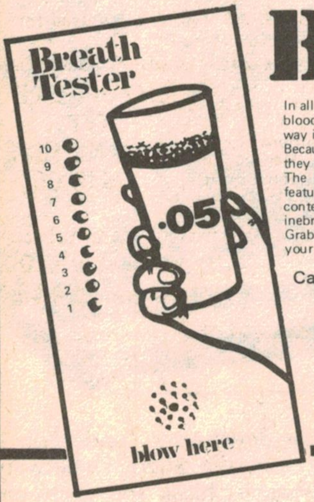

Breath Tester

In all states and territories in Australia it is an offence to drive a vehicle with an alcohol/blood concentration above a certain limit. In most states it's 0.05 others 0.08. Either way it's only a relatively small number of alcoholic drinks.
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Grab the whole kit now for only $29.95. You never know, it may save your licence or your life!

Cat. KA1522

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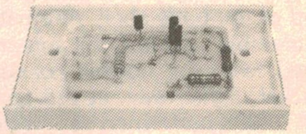

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The Minitune will measure voltage, resistance (down to a very low range), RPM and Dwell Angle.

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Specification

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Resistance	200Ω	100mΩ	0.5% · 1 digit
	20kΩ	10Ω	0.5% · 1 digit
R.P.M.	20,000r.p.m.	10r.p.m.	1% · 3 digits
Dwell	90	0.1	2% · 3 digits

FAR CHEAPER THAN DPM SEPARATELY

Ref: EA July 1983

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50V/5A laboratory power supply

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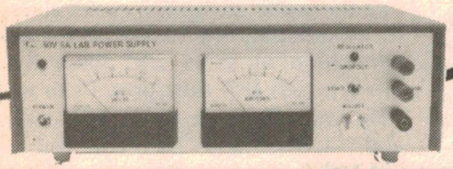

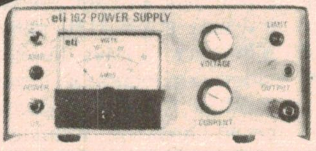

ETI 162

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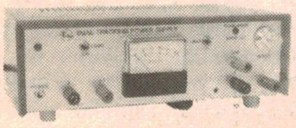

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Measures rpm, dwell, volts & ohms

Tacho/dwell meter for engine tune-ups

by GREG SWAIN

Featuring a 3½-digit liquid crystal display, this compact engine analyser can measure engine rpm, dwell, voltage and resistance. It is compatible with both electronic and conventional ignition systems and will save you money on petrol and engine tune-ups.

The Minitune is built into a calculator-style plastic case.

The Minitune engine analyser is the latest in our series of projects based on the DPM05 LCD voltmeter module. As with the digital multimeter described in our March issue, it comes as a complete kit of parts, packaged by the English firm Lascar Electronics Ltd and distributed in Australia by Jaycar Pty Ltd. The cost of the kit from Jaycar is $42.95 plus $2.95 for a pair of test leads.

While we have described several engine analysers in the past, the Minitune must surely take the prize as the most compact. Overall dimensions are just 80 x 110 x 35mm (W x D x H). It can be easily held in the palm of one hand and yet will prove very useful for fault finding in automotive electrics and for accurate engine tuning.

Main specifications of the Minitune include two voltage ranges (0-20V DC and 0-200V DC); two resistance ranges (0-200Ω and 0-20kΩ); and the ability to measure engine rpm and dwell on most 4-stroke petrol engines. Readers should note, however, that the unit will not read dwell on many cars fitted with electronic ignition. This is of academic significance only as the dwell angle on cars with electronic ignition is fixed and can not be adjusted.

Note also that the display only has 3½ digits, so all readings on the rpm range must be multiplied by 10. For the same reason, resolution on the rpm range is limited to 10rpm. Resolution on the dwell range is 0.1°, while accuracy of the tacho and dwell ranges is quoted as 1% ± 3 digits and 2% ± 3 digits respectively.

The voltage and resistance ranges have a quoted accuracy of 0.5% ± 1 digit.

Only two leads are required to connect the Minitune for use. On the tacho and dwell ranges, the leads are simply connected across the points, or across the coil-switching transistor in the case of electronic ignition (ie, between the negative end of the coil and chassis). Connections for voltage and resistance measurements are made in the conventional way.

One disadvantage of the unit is that it is not switchable to suit different engine categories (either 4, 6 or 8 cylinder). The literature supplied with the kit skims over this point, suggesting that the unit be calibrated to suit 4-cylinder engines. Tacho and dwell readings are then multiplied by two-thirds for 6-cylinder engines and halved for 8-cylinder engines.

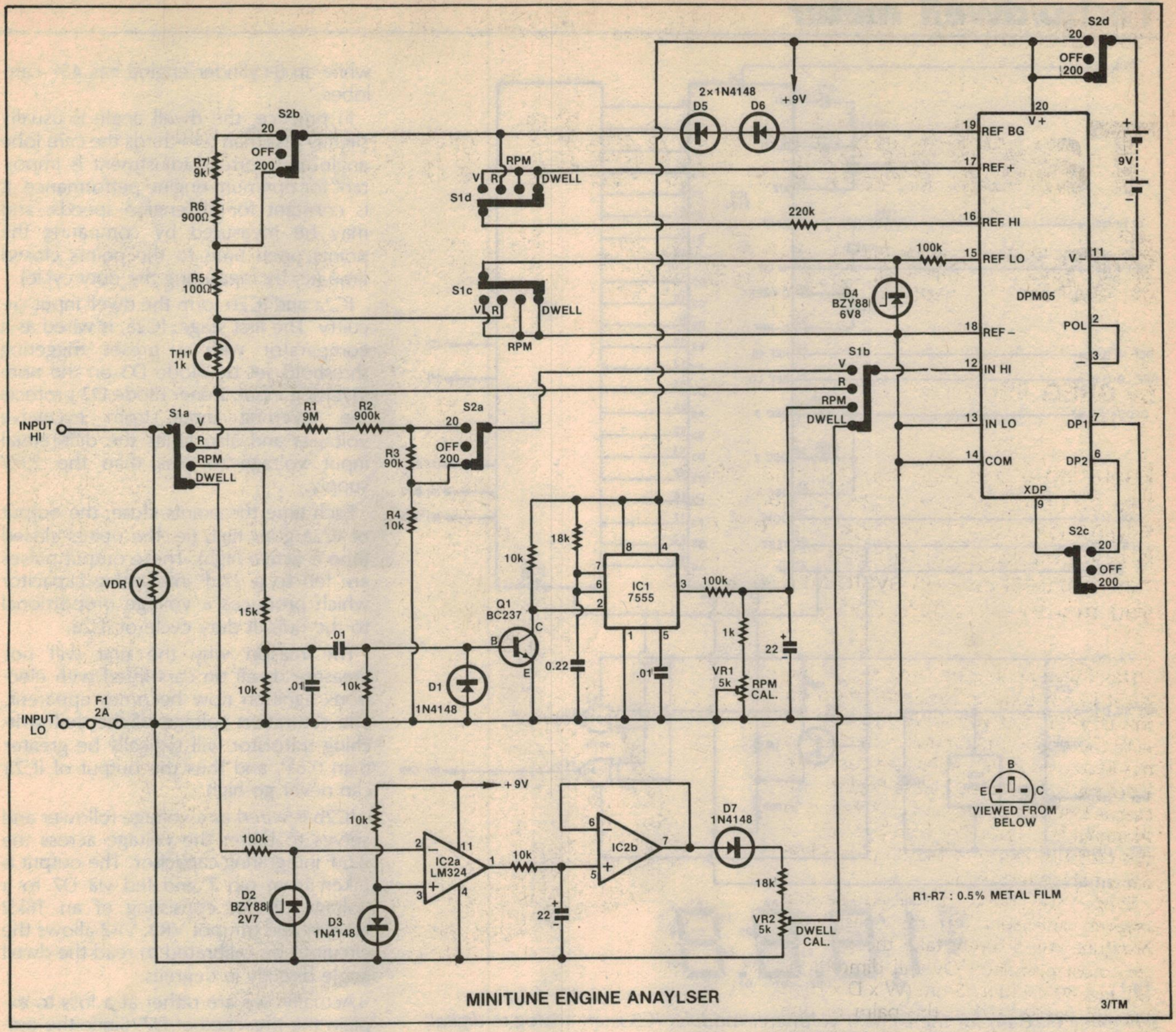
Our own experience with the Minitune, however, has shown that it is quite possible to calibrate the unit to suit 6-cylinder engines without any circuit changes. We'll have more to say about the subject of calibration a little later on.

The Minitune kit

The kit for the Minitune engine analyser includes two printed circuit boards (PCBs), a case, and all the parts necessary to make up two modules. These two modules are the DPM05 voltmeter module and a "conditioning" module branded DP401/2B. Also included is an instruction sheet giving brief details of the circuit operation and construction.

As supplied, the kit is complete apart from the 9V battery which must be purchased separately. In fact, we found that two components (a resistor and a diode) were left over at the end of construction. All the parts appear to be of good quality, while the two PCBs are made of fibreglass.

Construction of the kit should present



The circuit is built around the DPM05 module. Q1 and IC1 form the tacho circuitry while IC2 forms the dwell circuit.

few problems, although readers should note that many of the pads on the PCBs are quite close together. A fine-tipped soldering iron is necessary to build this kit and even then care should be taken to guard against solder bridges between adjacent pads.

How it works

The Minitune circuit is built around the DPM05 module which is essentially a high input impedance voltmeter with a full-scale reading of 199.9mV (see Fig. 1). At the heart of this module is the Intersil 7126 dual slope integration analog-to-digital converter chip (IC3). This chip drives the liquid crystal display directly and yet draws only 50μA.

IC6 is a high stability bandgap voltage reference and drives a voltage divider consisting of a 220kΩ resistor and a 10kΩ trimpot (VR3). VR3 is adjusted during the calibration procedure to provide a REF+ of 100mV. This forms a reference voltage against which the input voltage is compared.

Clock signals are provided by an internal 48kHz oscillator which is also divided to give the 60Hz backplane signal necessary to drive the display. This backplane signal is made available at the BP pin (pin 21), and is a square wave with an amplitude of ±2.5V with respect to the common rail.

Note that the common (pin 14) is maintained by the module at Vcc − 2.8V, and is used as the "earth" return for the external circuit.

In addition to the 3½-digit readout, the LCD also features decimal point indicators and a low battery annunciator. A decimal point is enabled simply by connecting the appropriate display pin to the XDP pin on the output of exclusive-OR gate IC4b.

Transistor Q2 senses the low voltage condition. When the battery voltage drops below a critical level (6.8V approx), Q2 turns off and IC4a gates through the inverted backplane signal to drive the "low bat" input.

Refer now to the main circuit diagram. It can be divided into four parts: the DPM05 voltmeter module, the tachometer circuitry (Q1 and IC1), the dwell circuitry (IC2a, 2b), and the resistive divider networks for the voltage and resistance functions. Switch S1 provides the function switching, while S2 provides range switching for the voltage and resistance measurements.

Tachometer mode

In the tachometer mode, the signal from the points is fed to a voltage divider and filtered by a .01μF capacitor. From there, the signal is applied to a differentiating network (.01μF and 10kΩ) which produces large positive and negative

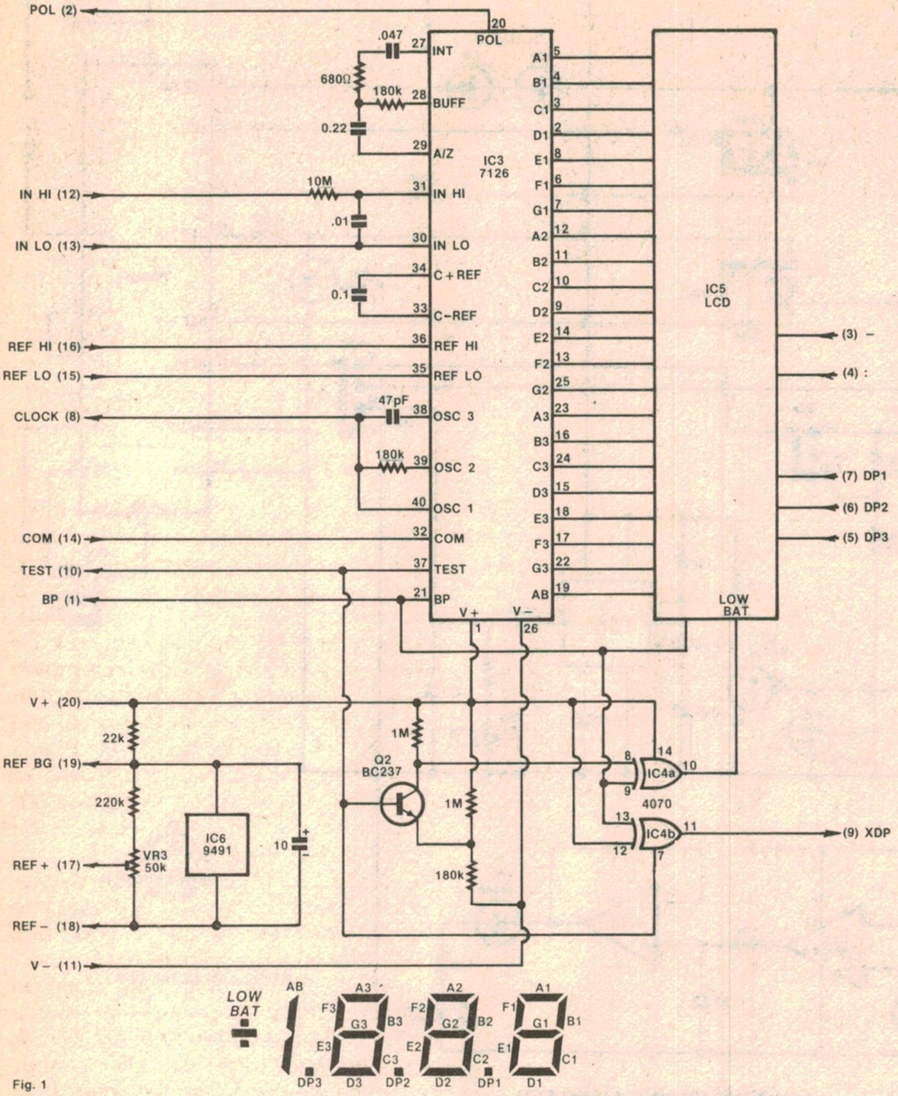


Fig. 1

Schematic diagram for the DPM05 voltmeter module. IC3 is an analog-to-digital converter chip that direct drives the liquid crystal display (IC5).

output spikes coinciding with the rising and falling edges of the input waveform. In this circuit, however, the large negative spikes are clipped by diode D1 to prevent damage to the base-emitter junction of transistor Q1.

Transistor Q1 is normally held off by its 10kΩ base-emitter resistor, and is briefly turned on each time a positive pulse is applied to its base. Q1 thus serves to invert the positive spikes, turning them into negative-going pulses with an amplitude approaching the 2.8V supply. These negative-going pulses are used to trigger IC1, a 7555 timer IC.

The 7555 is essentially a CMOS version of the familiar 555 timer. It is wired as a one-shot monostable and produces a short positive pulse on its pin 3 output whenever a negative pulse appears at its trigger input (ie, each time the points open). The monostable period is about 4.4ms, as set by the 18kΩ resistor and 0.22μF timing capacitor on pins 6 and 7.

IC1's output thus consists of a train of brief positive-going pulses of constant width and amplitude, the pulse rate depending upon the number of times the points open and close. These pulses are fed to a voltage divider and integrated by a 22μF capacitor to produce a steady DC voltage on the input of the DPM05 module. Trimpot VR1 allows the unit to be calibrated to read directly in rpm.

Dwell measurements

The dwell angle of a distributor is defined as the angle through which the distributor shaft rotates while the points are closed. A 4-cylinder engine, for example, has four distributor cam lobes spaced 90° apart and this represents the maximum possible dwell angle (ie, points permanently closed). Similarly, a 6-cylinder engine has 60° cam lobes, while an 8-cylinder engine has 45° cam lobes.

In practice, the dwell angle is usually slightly less than two-thirds the cam lobe angle and correct adjustment is important for optimum engine performance. It is constant for all engine speeds, and may be measured by comparing the points open time to the points closed time (ie, by measuring the duty cycle).

IC2a and IC2b form the dwell input circuitry. The first stage, IC2a, is wired as a comparator with a preset triggering threshold set by diode D3 on the non-inverting input. Zener diode D2 protects the inverting input from excessive voltages and also limits the differential input voltage to less than the 2.8V supply.

Each time the points close, the output of IC2a goes high (ie, the points closed time is active high). These output pulses are fed to a 22μF integrating capacitor which produces a voltage proportional to the output duty cycle of IC2a.

The reason why the unit will not measure dwell on cars fitted with electronic ignition now becomes apparent. The saturation voltage of the coil switching transistor will typically be greater than 0.6V, and thus the output of IC2a can never go high.

IC2b is wired as a voltage follower and serves to buffer the voltage across the 22μF integrating capacitor. The output is taken from pin 7 and fed via D7 to a voltage divider consisting of an 18kΩ resistor and trimpot VR2. VR2 allows the circuit to be calibrated to read the dwell angle directly in degrees.

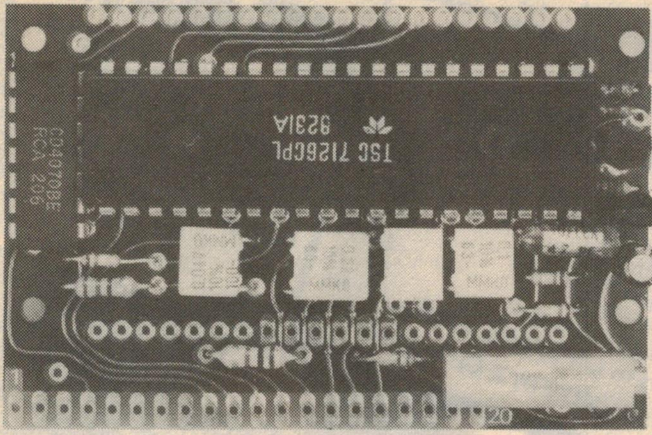
Actually, we are rather at a loss to explain the presence of D7. Since the output of IC2b can never swing negative, this component could presumably be replaced by a wire link with no change in circuit performance. We have included it in the circuit and overlay diagrams because that's the way it is presented in the kit. It does no harm by leaving it in circuit — it just seems unnecessary.

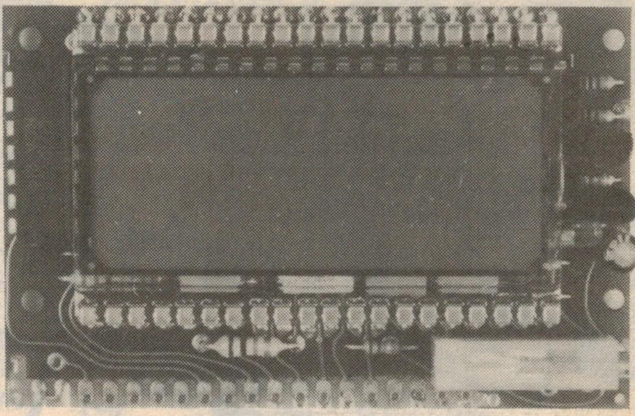
Voltage and resistance

The voltage and resistance measurement ranges are straightforward. For voltage measurements, resistors R1-R4 form a simple attenuator network with an input impedance of 10MΩ. S2a selects the appropriate attenuator setting and feeds the output via S1b to the IN HI input of the DPM05 module.

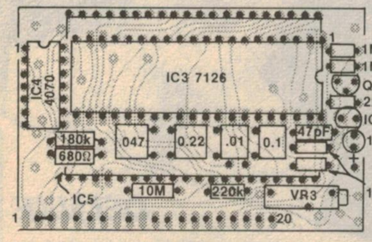
The voltage dependent resistor (VDR) is included to protect the meter circuitry against high-voltage transients.

For resistance measurements, the bandgap reference (REF BG) from the DPM05 is applied via D5, D6, S2b and S1 to fixed resistors R5-R7. The resulting

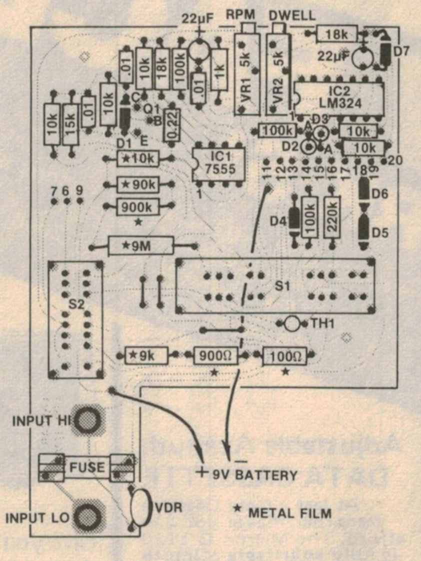




At left is the DPM05 module prior to mounting the LCD while at right is the completed module.



Here are the parts layout diagrams for the DPM05 (above) and DP401/2B modules. Check component polarity before soldering.



current is then passed through the unknown resistor connected to the meter terminals and the voltage across it is the resistance reading. The 1kΩ thermistor protects against any external voltage which may be present when "in-circuit" resistance measurements are attempted.

If an "in-circuit" voltage is present, D4 will turn on at about 6.8V to shunt the applied voltage. The resulting current through the thermistor causes its resistance to increase markedly and thus limit the current to a safe value.

Construction

Construction can begin with the assembly of the DPM05 display module. Begin by installing the wire link between pads 2 and 3 of the edge connector, then mount the various components according to the parts layout diagram. Note that the PCB uses plated-through holes, so soldering is required only on the underside of the board.

The accompanying photograph shows the module partially assembled, to the point where the LCD is ready to be fitted. This sits above the 7126 IC and most of the minor components, so it is essential that these be mounted as close to the PCB as possible. In particular, the two 1MΩ resistors in the top, right corner of the board must be kept well to the right, otherwise they will obstruct the 7126 IC.

Similarly, the four polyester capacitors beneath the 7126 must be mounted flat against the board. Bend the leads at right angles to the capacitor body before inserting them in the appropriate holes. The .047µF capacitor sits to the left of its mounting holes, while the other three sit to the right.

Note that there are a couple of plated-through holes near the .01µF capacitor which are not used (see photo and parts layout diagram). Similarly there is an unused hole under the 220kΩ resistor to the left of the 50kΩ trimpot. There are other unused holes but, provided the parts layout diagram is followed carefully, these should not cause any confusion.

Correct orientation of the LCD is important and is determined by either a blue bar or a small detent in the mask at one end of the display. This mounts to the left. Push the LCD down as far as it will go, so that it sits flat on the 7126 IC, then carefully solder the pins.

Finally, clean the flux off the back of the board using methylated spirits. It only takes a small leakage current between adjacent tracks or between the input terminals of the module to upset its operation.

The completed module can now be tested using the simple test circuit shown in Fig. 2. Temporarily connect the battery clip between pins 11 (negative) and 20 (positive), connect pins 13, 14, 15 and 18 together, and connect pins 16 and 17 together. Now short the two input terminals (pins 12 and 14) together – the display should read "000".

In some cases, however, the display may read "001" or "–001", or even cycle regularly between "–001", "000" and "001". This is quite normal.

The DPM05 module can also be calibrated at this stage, assuming that a suitable 100mV reference voltage is available. We used the DC Voltage Reference described in the June 1976 issue. To calibrate the module, connect the reference voltage between pins 12 and 14 and adjust VR3 for a reading of "1000".

Don't worry if you haven't got a suitable reference voltage, though. The DPM05 can be easily calibrated after the Minitune has been fully assembled as we shall see later on.

DP401/2B module assembly

Construction of the DP401/2B module is straightforward. As before, take care with component orientation and don't forget the three wire links adjacent to switch S1. The thermistor (TH1) and the voltage dependent resistor (VDR) can be mounted either way round.

Note that seven of the resistors (R1-R7 on the circuit) are 0.25% metal film types. These are marked with asterisks on the parts overlay diagram, so be sure to use a metal film resistor wherever you see an asterisk. Do not substitute carbon film types, otherwise the accuracy of the voltage and resistance ranges will be degraded.

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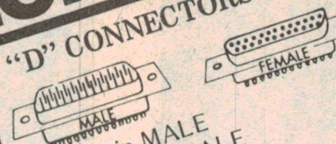

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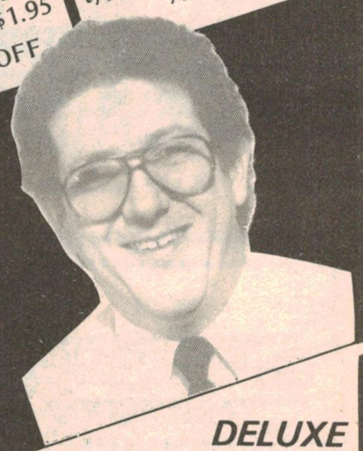

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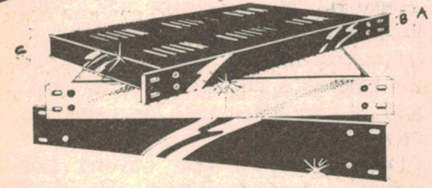

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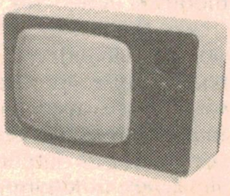

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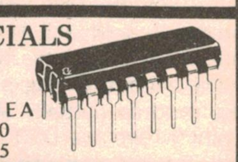

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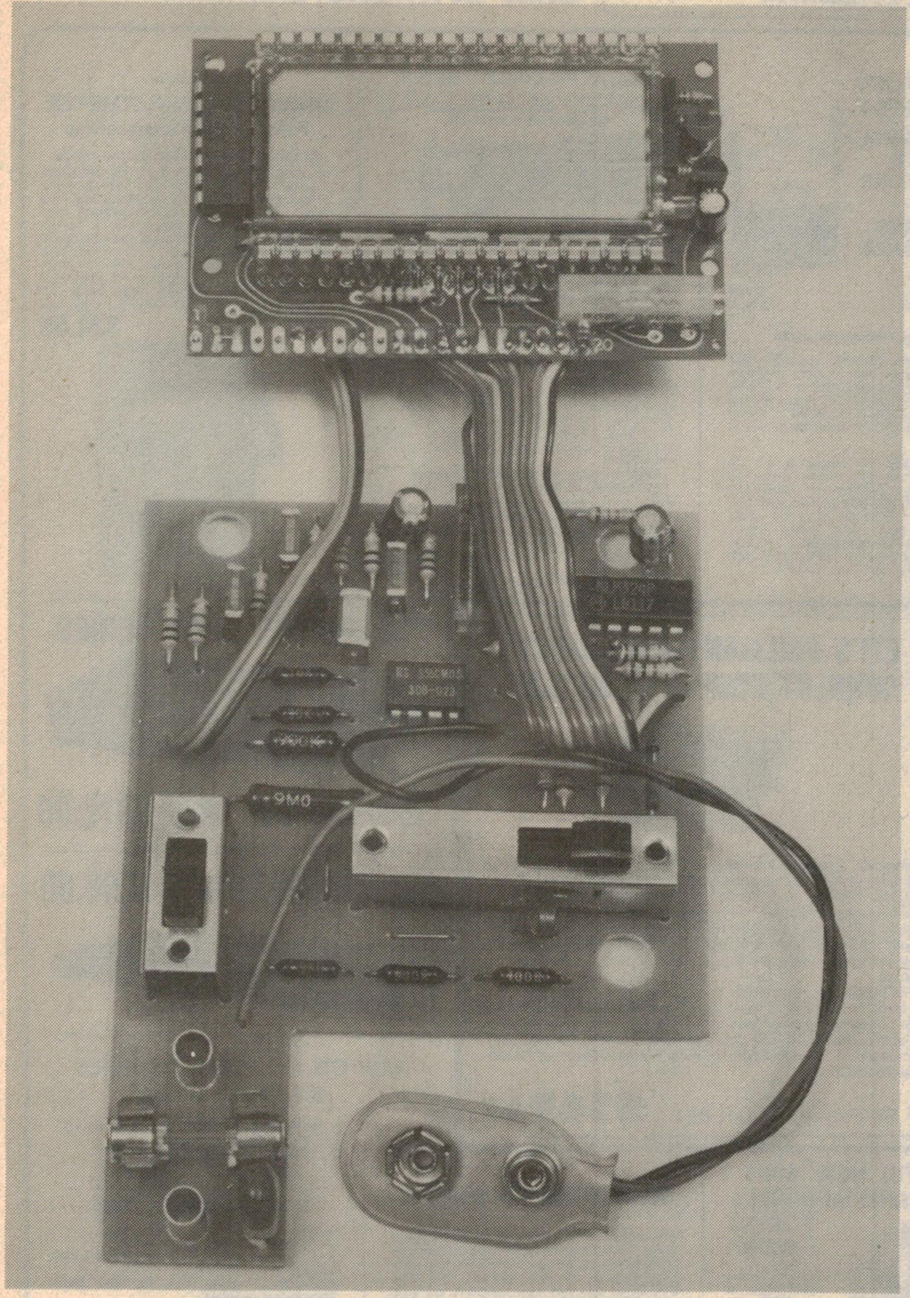
Specials for the month of July unless sold prior to the end of the month.



This view shows the Minitune all wired up and ready for testing. The rainbow cable connecting the two modules should be kept as short as possible.

The two switches can only be mounted one way and should be pushed down on to the PCB as far as they will go. Check that they are perpendicular to the PCB before soldering the terminals – if crooked, they will not line up with the slots in the front panel. Similarly, make sure that the two input terminals are also perpendicular to the PCB.

When the main PCB is completed, it can be wired to the DPM05 module using rainbow cable. One 10-way 5cm length of cable is connected between the DPM05 and a group of holes below the LM324 IC, while a 3-way length of cable is connected to a second group of holes above switch S2. Finally, connect the battery clip leads to the main PCB.

To test the unit, connect the battery and switch to the 20V voltage range. The display should read "0.00" (or, more likely, "0.01" or "−0.01"). Now switch to the resistance ranges. With the input leads open circuit, the display should show a "1" at the leading digit with all other digits blanked. This indicates the over-range condition. The display should now read zero with the input leads shorted together (either "0.00" or "00.0", depending on the range selected).

One problem that may become evident at this stage is that the unwanted

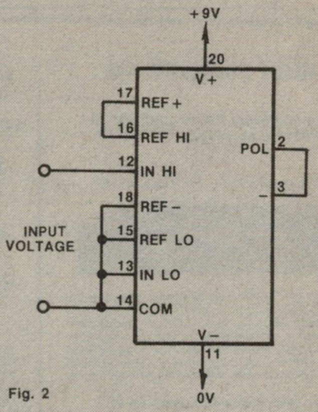


Fig. 2

Use this test circuit to check the DPM05 for correct operation.

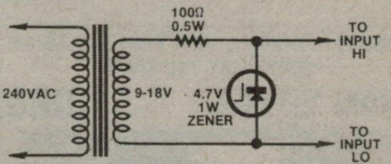


Fig. 3

This simple calibration circuit uses the mains as a frequency reference.

decimal point has a tendency to partly turn on. If this proves to be the case, the solution is to connect 1MΩ resistors between each decimal point annunciator (DP1 and DP2) and the backplane pin (pin 1). These resistors will prevent noise from turning on the decimal point annunciators, yet allow normal operation of each annunciator when it is connected to XPD.

Calibration

If you haven't already done so, the first step in the calibration procedure is to calibrate the DPM05 module. To do this, select the 20V range and connect a suitable voltage of around 12V to the input terminals and to your DVM. Trimpot VR3 on the DPM05 module should now be adjusted so that the reading on the Minitune matches the DVM reading.

The tachometer range is calibrated by using the mains as a frequency reference. Fig. 3 shows the calibration circuit. This uses a 4.7V zener diode to clip the secondary output of a mains transformer to provide a suitable input waveform. Most readers will have a suitable transformer on hand.

Connect the output of the calibration circuit to the Minitune and temporarily connect a 0.1μF polyester capacitor in parallel with the .01μF capacitor con-

nected to the base of Q1. Trimpot VR1 should now be adjusted so that the display reads 1500rpm (1.50) for a 4-cylinder car, or 1000rpm for a 6-cylinder car. Remove the 0.1μF capacitor when you have finished this step.

The dwell calibration is even easier. All you have to do is leave the input leads open circuit and adjust VR2 for a full-scale reading of 90° (90.0) for a 4-cylinder car or 60° for a 6-cylinder car. You should get the same reading when the input leads are shorted together.

Owners of 8-cylinder cars should calibrate the tacho and dwell ranges as for a 4-cylinder car. The tacho and dwell readings are then halved to get the correct readings.

The case

Construction can now be completed by mounting the two modules in the case. As supplied, the case consists of two sections which press together and are held by two long self-tapping screws. There is also a small bezel which mounts on the outside of the case and supports the display module, the latter being held by four small self-tapping screws.

The DP401/2B module is retained by three locating studs which fit three holes in the board. It will be necessary to fold the rainbow cable to allow everything to fit when the two sections of the case are pressed together. Having said that, the case is really too small and a great deal of patience is required to achieve a neat result (it helps if the wiring between the two modules is kept as short as possible).

Despite our best efforts, we were unable to get the case to close neatly although admittedly our wiring was longer than necessary to allow the case to be opened for photography. The display bezel also had a tendency to lift at one corner, as it is only held in place by an interference fit between the bezel, case and components.

Because of this, some constructors may wish to consider mounting the electronics in a plastic zippy box. It should then be a simple matter to add switching so that the unit can be used with different engine categories. This would involve switching in different voltage divider networks across the outputs of the tacho and dwell circuits.

We should also point out that the "multimeter-style" test leads sold with the kit are unsuitable for connecting the Minitune to an automotive ignition system, although they are suitable for voltage and resistance measurements. Readers are therefore advised to make up a second pair of test leads fitted with alligator clips. In addition to the alligator clips, you will need two 4mm banana sockets (1 red, 1 black) and suitable lengths of red and black hook-up wire.

That's it — project completed and ready for engine tuning! Drive safely.

PARTS LIST

DP401/2B Module

1 plastic case
1 bezel
2 fuse clips
1 2A fuse
2 4mm PCB-mounting terminals
1 printed circuit board, DP401/2B
1 9V battery, Eveready 216 or equivalent
1 battery snap connector (216)

SWITCHES
1 4-pole, 4-position slide switch
1 3-pole, 3-position slide switch

SEMICONDUCTORS
5 1N4148 dodes
1 BZY88 2V7 zener diode
1 BZY88 6V8 zener diode
1 7555 CMOS timer IC
1 LM324 quad op amp IC
1 BC237 NPN transistor

CAPACITORS
2 22μF 10VW electrolytic
1 0.22μF polyester
3 .01μF polyester

RESISTORS (0.25% metal film)
1 x 9MΩ, 1 x 900kΩ, 1 x 90kΩ, 1 x 10kΩ, 1 x 9kΩ, 1 x 900Ω, 1 x 100Ω

RESISTORS (carbon film, 5%)
1 x 220kΩ, 3 x 100kΩ, 2 x 18kΩ, 1 x 15kΩ, 5 x 10kΩ, 1 x 1 kΩ, 2 x 5kΩ multiturn trimpots, 1 x 1kΩ thermistor, 1 VDR.

DMP05 Module

1 printed circuit board, DPM05/3B

SEMICONDUCTORS
1 7126 A/D converter
1 4070 exclusive-OR gate
1 9491 voltage reference
1 BC237 transistor
1 3½-digit LCD

CAPACITORS
1 10μF 10VW electrolytic
1 0.22μF polyester
1 0.1μF polyester
1 .047μF polyester
1 .01μF polyester
1 47pF polystyrene

RESISTORS (½W, 5%)
1 x 10MΩ, 2 x 1MΩ, 1 x 220kΩ, 3 x 180kΩ, 1 x 22kΩ, 1 x 680Ω, 1 x 50kΩ multiturn trimpot.

Calibration Circuit

1 100Ω 0.5W resistor
1 4.7V 1W zener diode

Simple circuit uses two 3-terminal regulators

±12V rails for the Lab Power Supply

Here is an inexpensive addition to the 50V 5A Lab Power Supply which should prove its worth many times over. It provides additional fixed ±12V outputs for low power applications, in particular for powering integrated circuits.

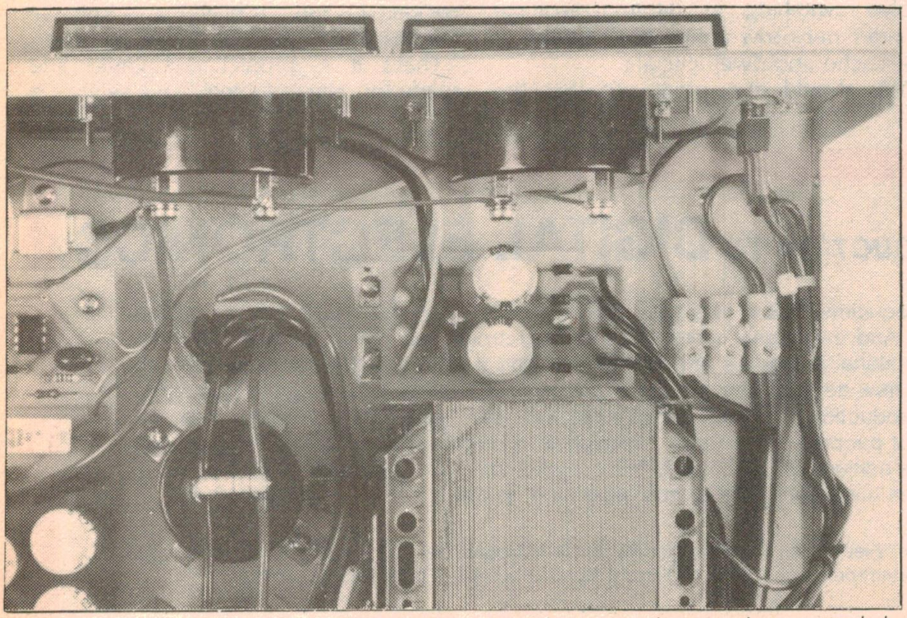
by JEFF SKEEN

In many applications where a high output power supply is used, it is also desirable to provide power to some associated low voltage circuitry. This circuitry often contains integrated circuits which require dual power supplies. Our low cost addition uses the two 15V windings on the power transformer to provide fixed ±12V outputs.

This idea was in fact canvassed in a letter to the Editor from Ferguson Transformers Pty Ltd in the June issue. (Great minds do think alike!). As outlined in the letter on page 100 of the June issue, the two 15V windings can be earthed and used as an electrostatic shield while still leaving them available to provide auxiliary supply rails. By using a bridge rectifier, balanced positive and negative 20V supplies are provided.

After filtering with 1000μF electrolytic capacitors, the ±20V supplies are stabilised to ±12V with three terminal regulators. While the regulators themselves and the relevant windings on the transformer can easily deliver one amp or so, the actual maximum output current will depend to a large extent upon the total power being delivered from the main 36V windings on the transformer.

Even so, unless the main supply is delivering 100 watts or more, the output of the fixed ±12V regulators will not be significantly reduced below one amp. Note that if the ±12V regulators do drop out of regulation, there will be no indication on the front panel of the supply. (The regulator "drop out" indicator applies only to the main supply.)



This view shows how the new PCB is mounted between the transformer and the voltmeter. The two 3-terminal regulators are bolted to the chassis (see Fig. 1).

A pair of 0.1μF capacitors provides high frequency unregulated filtering of the ±20V supply rails, ensuring that no spurious frequencies from the switchmode circuits get into the regulators.

In common with other three terminal regulators, these are proof against output short circuits and overheating, which makes them essentially indestructible. A 10μF tantalum capacitor has been placed on the output of each regulator to bypass any high frequencies picked up by the wires leading to the output terminals.

This also keeps the regulator stable, prevents oscillation, and provides a bonus by improving the transient response of the regulator.

One disadvantage of connecting the centre of the winding to earth is that the ±12V output does not float but is tied to earth. This connection does not affect the high power output which remains floating with respect to earth. However, we do not regard this as a serious drawback.

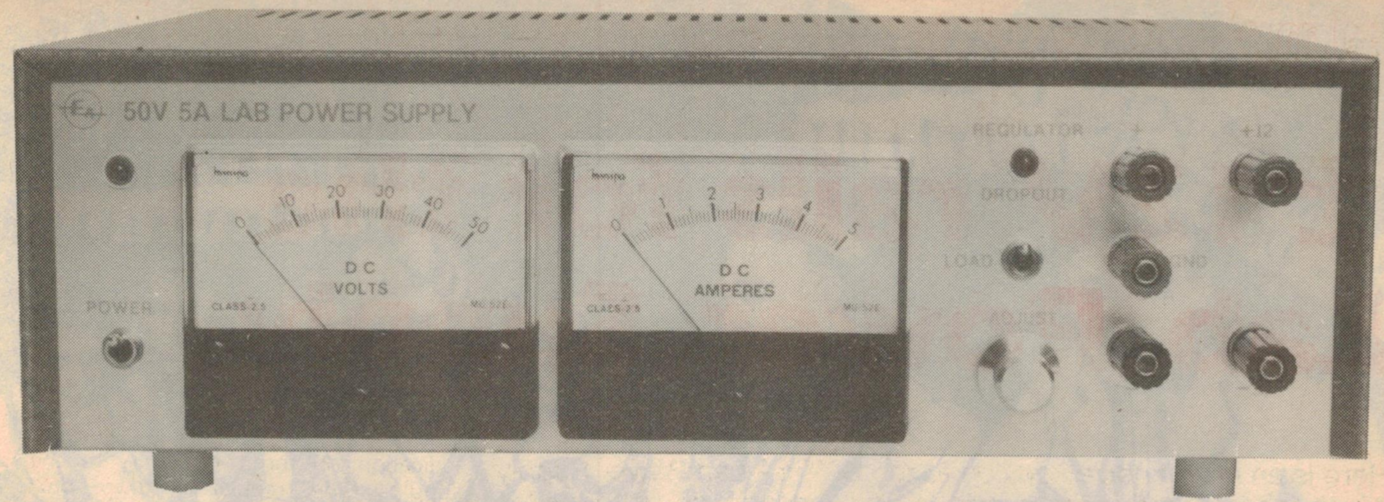
Construction

We assume that most kit suppliers will supply a front panel with provision for the ±12V supply terminals. If you have an old front panel the two new output terminals can be squeezed in alongside the old terminals or placed underneath them.

The circuit is built on a small printed circuit board (PCB) coded 83ps7 and measuring 66 x 36mm. The PCB fits in the space between the transformer and the voltmeter and the first step is to lay out and drill the PCB mounting holes in the chassis, using the blank board as a template.

If you are adding this project to an already completed power supply, take care to remove all metal drill shavings from the interior of the case at the completion of drilling.

Now mount all components, except



The ± 12V terminals are fitted to the right of the existing output terminals.

PARTS LIST

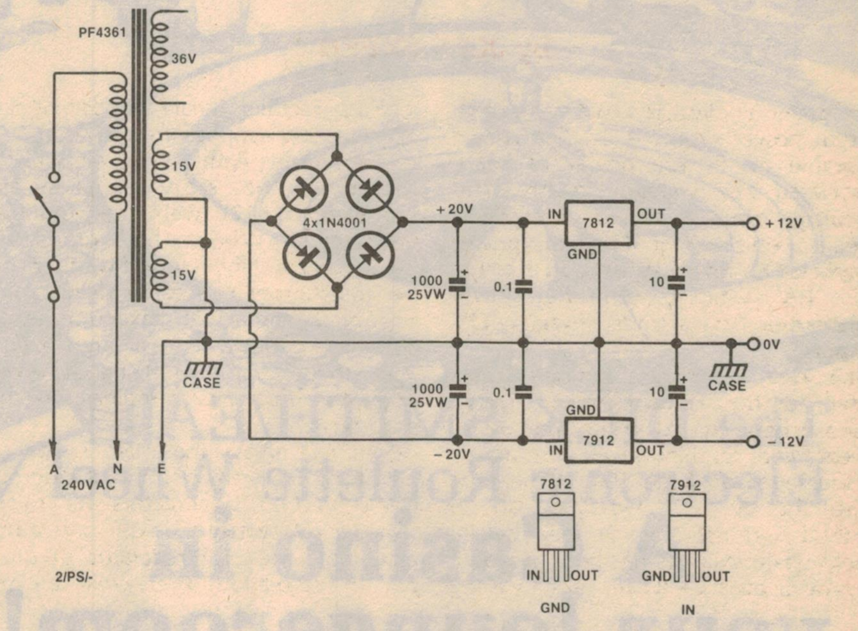
1 PCB measuring 66 x 36mm, code 83ps7
2 12mm tapped, insulated PCB standoffs
4 6mm machine screws to suit standoffs
2 TO-220 mounting kits, with screws to suit
1 metre hookup wire
1 red binding post terminal
1 black binding post terminal

SEMICONDUCTORS
4 1N4001 diodes
1 7812 three-terminal regulator
1 7912 three-terminal regulator

CAPACITORS
2 1000μF 25VW electrolytic
2 10μF 16VW tantalum or low leakage electrolytic
2 0.1μF ceramic

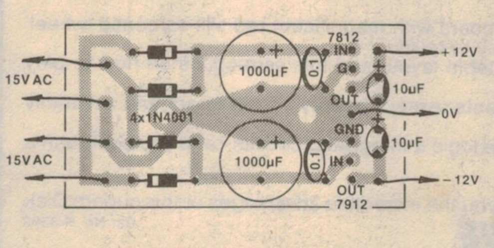
MISCELLANEOUS
Nuts, bolts, heatsink compound for mounting regulators, etc.

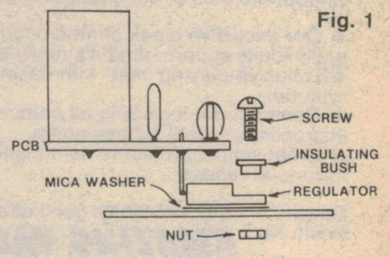
PRICE ESTIMATE: We estimate that the cost of parts for this project is $13.



The circuit uses a bridge rectifier followed by two 3-terminal regulators.

Fig. 1





Parts layout diagram (above) and regulator mounting method (right).

the regulator ICs, on the PCB. Since most of the components are polarised, double check the orientation before soldering each one into place.

The regulators are mounted from the copper side of the PCB. First, bend the regulator leads at 90° to the body, at the point where they leave the body, and toward the plastic side of the body.

Attach the two insulated standoffs to the PCB then place the regulators in position from the copper side of the PCB. Sit the entire assembly on a flat surface, such as a table top, and adjust each regulator so that its back (or metal tab) sits flat on the table. (See accompanying diagram).

The three regulator leads extending through the PCB are now bent over so that each regulator is temporarily held in position. The entire assembly is then turned over and the regulators soldered in place.

The PCB should now be screwed to the chassis and the holes in the regulator tabs used to locate the regulator mounting holes. The holes, when drilled, should be carefully deburred, using a large diameter drill. Measure out appropriate lengths for the PCB input and output wires then solder these to the PCB while it is out of the chassis.

Smear heatsink compound onto both sides of two TO-220 mica washers then place them in position on the chassis so that the holes in the washers and the

Continued on page 150.

The DICK SMITH/EA Electronic Roulette Wheel

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See page 98 for full address details

New design has LCD and counts to 19,999!

A general-purpose 4½-digit event counter

Looking for a general-purpose event counter that's easy to build? This design features a 4½-digit liquid crystal display, low power consumption, and a maximum count of 19,999. It is battery powered and uses only a handful of components.

by JOHN CLARKE and GREG SWAIN

So what does an event counter do? Well, as its name implies, an event counter is a circuit that counts the number of times a particular event takes place and displays the result. Typical applications include counting the number of objects on a production line, a lap counter for a slot car or model train set, or even counting the number of sheep through a race.

Other possible uses include a coil winding counter, a turnstile counter, a lap counter for sports events, or counting the number of people that enter and exit through a doorway. One staff member even suggested that the Event Counter could be used by prisoners to count off the days! That would certainly be within the capabilities of this unit, since 19,999 days is almost 55 years!

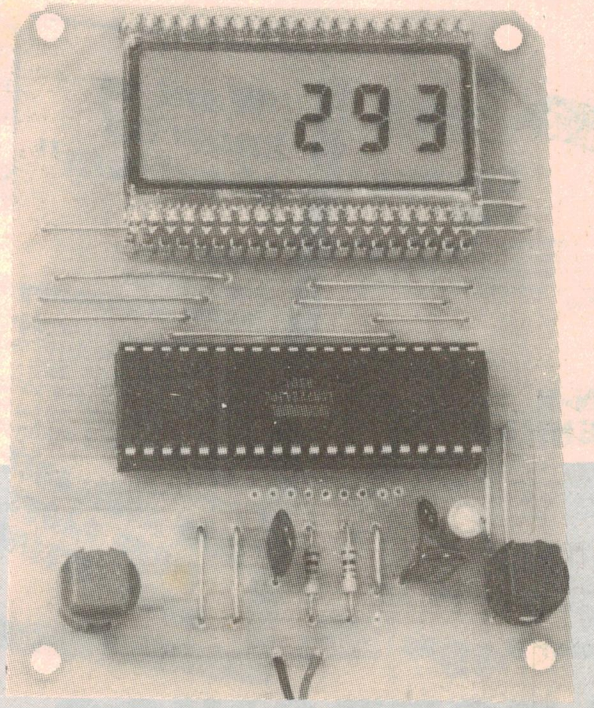
Practical operation of the Event Counter is simple — the device is incremented by one each time the clock input is pulled low. We used a momentary contact pushbutton switch to trigger the prototype, but you can use virtually any trigger input that's convenient. For batch counting on a production line, for example, the Infrared Light Beam Relay described in April 1981 would provide an ideal trigger input.

Alternatively, you can trigger the Event Counter using relay contacts, reed switches, microswitches, or CMOS switches. Logic signals may also be used, provided they are compatible with the supply rail of the Event Counter.

The Event Counter is reset to zero simply by pressing the reset switch. As before, we used a momentary contact pushbutton switch, but the reset function can also be carried out automatically using any of the above methods if you wish.

But that's not all this versatile module can do. In addition to event counting, it can also form the heart of a very effective digital frequency meter (DFM). Next month, we intend to describe a compact module which, when teamed with the Event Counter, will form a compact 2MHz DFM that should prove very attractive to the hobbyist.

On board the add-on module will be an input preamplifier and prescaler stage, a timebase, and housekeeping circuitry to provide the reset and latch enable signals required by the counter module. But enough of this for the time being — we'll give you all the details next month.



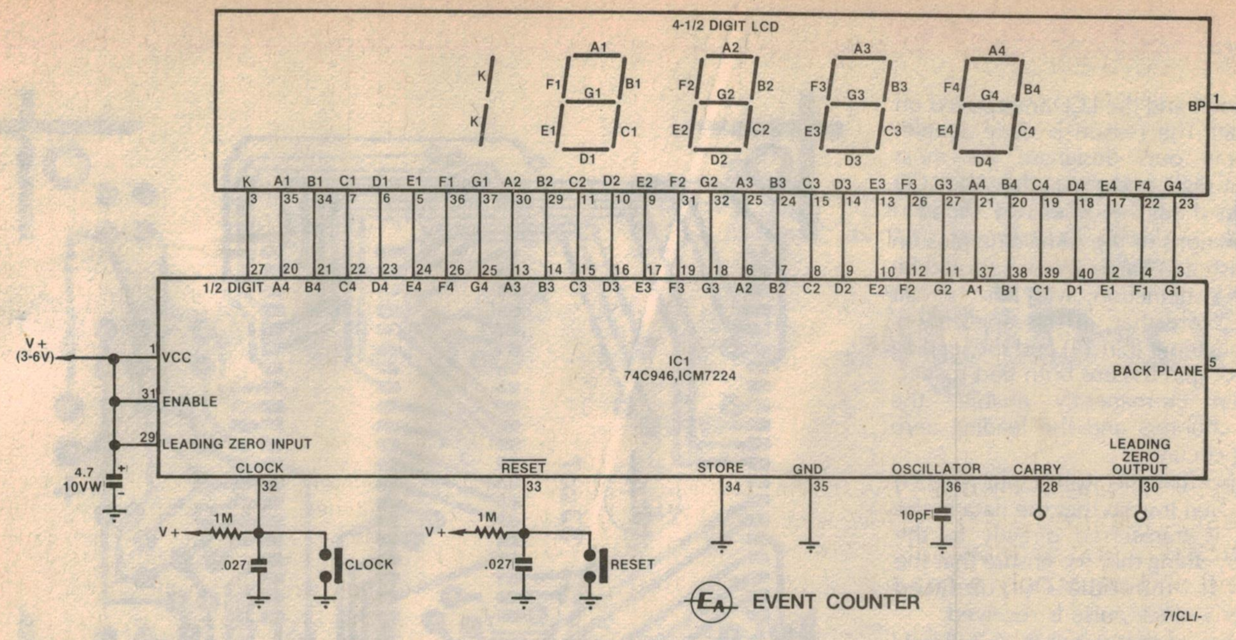
This view shows how easy the Event Counter is to build.

Design features

Apart from the LCD, our new Event Counter uses just one IC and a few minor components. The parts are all contained on a small printed circuit board (PCB) that can be easily assembled into a plastic zippy case. Power is derived from four 1.5V penlite cells which provide a 6V supply, thus making the unit completely portable.

One very worthwhile feature of the display is leading zero blanking. In addition to providing a more attractive display, this also means that the display is completely blanked whenever the reset button is pressed. No on/off switch has been provided — with a power consumption of just 20μA, the circuit doesn't need one!

As can be seen from the photograph, we mounted the clock and reset switches directly on the PCB. However, the switches can be mounted remotely if



The circuit uses a single 4½ digit counter IC to direct-drive a liquid crystal display.

this is more convenient, or you can replace the switches with any of the trigger inputs described above. The main thing to watch out for here is that voltages from the external trigger source do not exceed the +6V supply rail.

How it works

It's a long time since we've published a circuit simpler than this one. Most of the work is performed by integrated circuit IC1, a 74C946 device made by National Semiconductor. Intersil make a pin compatible device designated the ICM7224, but the National Semiconductor device is slightly cheaper. Each will do the job equally as well.

A word of warning: do not use the Intersil ICM7224A chip. This device is a seconds/minutes/hour counter with a maximum count of 15,959. It is NOT equivalent to the ICM7224.

National Semiconductor describe the 74C946 as a "4½-Digit Counter/Decoder/Driver for Liquid Crystal Displays". This 40-pin LSI device has a four-decade counter plus all the circuitry necessary to direct-drive the LCD. This circuitry includes BCD to 7-segment decoders, output latches, segment drivers, count inhibit, and a backplane oscillator.

In addition, the chip contains circuitry for leading zero blanking, and a D-type flip-flop and latch to drive the half-digit segments on the LCD. A Schmitt trigger is provided on the clock input to allow operation in noisy environments or with slowly changing input signals.

Although the 74C946 and ICM7224 devices are pin compatible, there is a wide discrepancy in the maximum clock frequency specified for each device. National Semiconductor specify the maximum clock frequency for the 74C946 as typically 2MHz, while Intersil guarantee the ICM7224 to 15MHz with typical operation to 25MHz. This discrepancy is of no consequence in this project, however. Nor is it of any consequence in the DFM to be described next month, since the prescaler circuitry divides the input frequency by 100 and the display overranges at 2MHz.

A feature of LCDs is that their response time is too slow to permit multiplexing. As a result, each segment of the display must be driven separately and, for a 4½-digit display, this means 29 segment connections plus the backplane signal connection. The 74C946 thus has 29 segment driver outputs and these are labelled A1 – G1 for the least significant digit through to A4 – G4 for the digit-4 segments. Pin 27 drives the two ½-digit segments.

So why are the segment connections

Pin connections for the 74C946

Backplane In/Out – When the oscillator pin is grounded this pin is an input allowing an external device to generate the backplane waveform. When the oscillator pin is left open this pin is an output supplying backplane drive for an LCD.

Oscillator – The oscillator frequency may be lowered by tying a capacitor between this pin and ground. If this pin is grounded the backplane pin becomes an input.

Store Input – This controls the latches. When low, the latches are in flow-through mode (latch outputs follow counter), but when taken high data on counter outputs is stored in latches and displayed.

Reset Input – When low, counters are reset to zero.

Clock Input – Advances counter on negative edge.

Enable Input – When low, halts counter operation.

Leading Zero Input (LZI) – When high, enables leading zero blanking.

Leading Zero Output (LZO) – This signal goes high when counter equals zero and LZI is high.

Carry Output – Goes high for one clock period when count of 9999 is reached.

A1-G1 – Digit 1 segment outputs.
A2-G2 – Digit 2 segment outputs.
A3-G3 – Digit 3 segment outputs.
A4-G4 – Digit 4 segment outputs.

½-Digit Output – Goes high when count goes from 9999 to 0000 and stays high until Reset goes low.

We estimate that the current cost of components for this project is approximately

$32

This includes sales tax.

between IC1 and the LCD transposed on the circuit? The reason is quite simple: the IC pin outs designate the most significant digit as digit-1, while the LCD designates them the other way round.

The functions of the remaining pins on IC1 are listed in Table 1 which should be read in conjunction with the circuit diagram. Note that, in this application, the enable input (pin 31) and the leading zero input (pin 29) are both tied to Vcc. This step permanently enables the internal counters and the leading zero blanking circuitry.

Note also that the store input (pin 34) has been tied low so that the data in the counters is transferred directly to the latches. By doing this, we ensure that the display is immediately updated whenever a clock pulse is received.

Operation of the circuit is as follows: normally, the clock and reset inputs (pins 32 and 33) are held high by 1MΩ pull-up resistors. The counter is incremented by one each time a negative going signal appears on the clock input (ie, pin 32 pulled low) and the total count displayed for as long as the reset input remains high. Pressing the reset switch pulls pin 33 low, resetting the counter to zero and blanking the display.

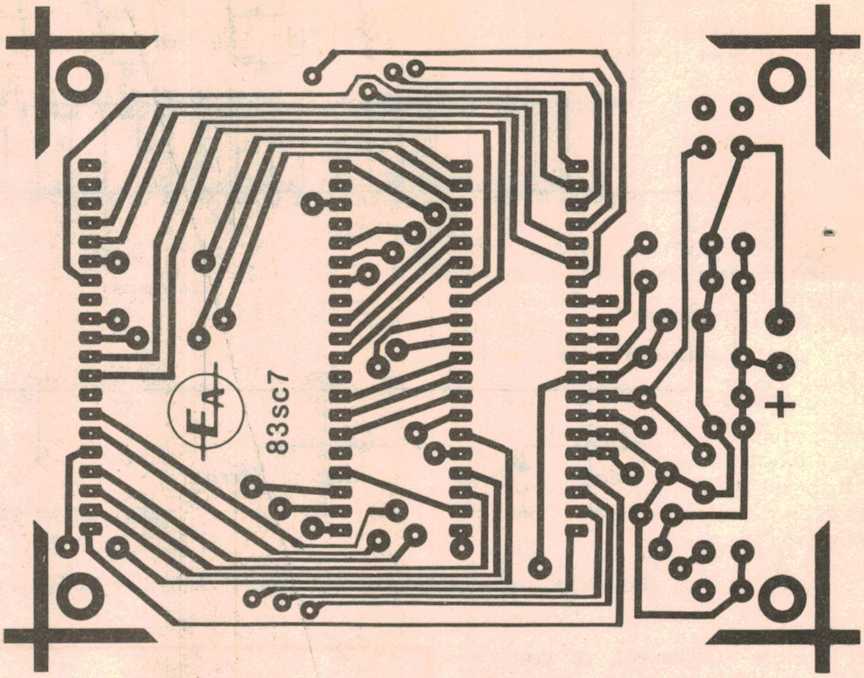
The two .027μF capacitors in parallel with the clock and reset switches provide switch debouncing. In addition, a 4.7μF capacitor has been connected to Vcc to provide supply decoupling.

The backplane signal is derived from an on-chip RC oscillator. This oscillator normally free runs at approximately 16kHz and is divided by 128 to provide a 125Hz output at pin 5. In this circuit, however, the backplane signal has been reduced to around 40Hz by connecting a 10pF capacitor to the oscillator terminal, pin 36.

Incidentally, the backlane and segment drive signals are 180° out of phase and have matched rise and fall times. This is done to eliminate any DC component in the driving waveforms which would otherwise degrade display life.

Before leaving the circuit description, it's worth noting that the 74C946 includes a carry output (pin 28) so that the device can be easily cascaded in 4-digit blocks. This pin goes high for one clock period when a count of 9999 is reached and then goes low for the next count. Also provided is a leading zero output (pin 30) which allows correct leading zero blanking when two or more devices are cascaded.

Finally, the backplane driver can be disabled by grounding the oscillator pin, thus allowing the device to be slaved to a master backplane signal. While this master backplane would typically be provided from one of the cascaded



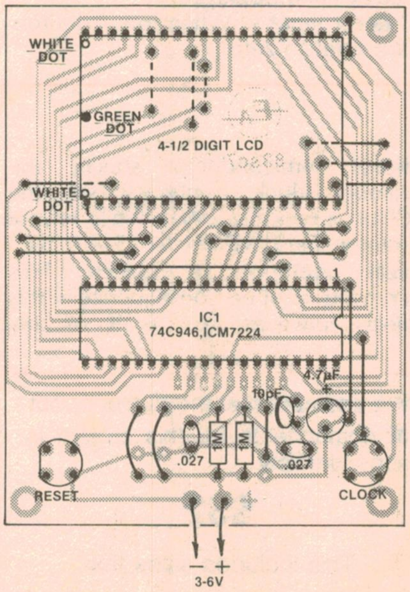
Above is an actual size reproduction of the PCB artwork.

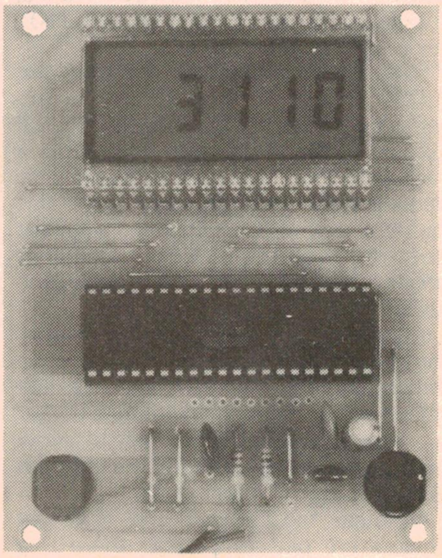
PARTS LIST

1 printed circuit board, code 83sc7, 78 x 102mm
2 momentary contact pushbutton switches (click action type)
1 battery clip
1 4-way AA battery holder
4 1.5V size AA batteries
1 40-pin DIL IC socket
1 48-pin Molex IC socket strip
1 4½-digit liquid crystal display (Dick Smith Catalog No. Z-4175 or equivalent)
1 74C946 or ICM7224 4½-digit counter/display driver
1 4.7μF/10VW electrolytic capacitor
2 .027μF metallised polyester capacitors (greencap)
1 10pF ceramic capacitor
2 1MΩ resistors (¼W, 5%)

MISCELLANEOUS

Tinned copper wire, solder, case to suit (optional), machine screws and nuts, etc.





Compare this photograph with the parts layout diagram at left.

devices, an external source should be used if more than four devices are to be cascaded.

Construction

Construction is straightforward with all parts mounted on a small PCB coded 83sc8 and measuring 78 x 102mm. Install the wire links first, followed by the resistors and capacitors. There are 20 wire links in all, several of which mount underneath the display. These latter are shown dotted on the parts overlay diagram.

The IC is mounted using a 40-pin DIL socket, while two 20-pin Molex IC socket strips are used to mount the LCD. Solder each socket strip to the PCB, then snap off the two carrier strips so that each pin connector is separated from its neighbour. This done, the LCD can be carefully installed on the board.

The LCD used in the prototype is a 4½-digit type sold by Dick Smith Electronics (catalog No. Z-4175). Other parts retailers will doubtless have a pin-compatible device available by the time this article appears in print.

It is important that both the LCD and IC be correctly oriented. Pins 1 and 40 of the LCD are identified by small white dots, and these go towards the left. Our sample display also had a green dot between pins 1 and 40 on one end of the glass envelope (see parts overlay diagram). Different devices from different manufacturers may use variations on the above theme, however.

Pin 1 of the IC is identified by a small notch at one end of the device. This mounts towards the right. Note that the IC is a CMOS device and can be easily damaged by static electricity. Do not remove it from its protective foam package until you are ready to install it, and then avoid touching the pins.

The clock and reset switches are both good quality momentary contact types that feature a positive click action. Do not use cheap pushbutton switches here, otherwise you could experience switch bounce problems. We elected to mount the switches on Molex IC pins to keep them on the same plane as the surface of the LCD.

Connect up the battery clip, give the circuit a final check over, and apply power. The display should now increment by one each time the clock switch is pressed and reset to zero (ie, display blank) when the reset switch is pressed.

We're sure that you will discover many potential applications for your Event Counter. Watch out for our article next month describing construction of the 2MHz DFM.

ELECTRONIC AGENCIES

TWEETERS

Foster Cone Tweeter CO5ONO8
6OW RMS System Power. Freq. 3-2O khz. Spl 91 db.
CE2OO3
$5.50

Philips Cone AD2273T8
Freq. 3OW RMS System Power. 1.5K-1O khz.
CE2OO4
$2.95

Philips ADO14O8/T8 Dome
5OW RMS System Power. Freq. 1.6K-2O khz. Spl 9O db.
CE2OO8
$12.95

Philips ADO162/T8 Dome
8OW RMS System Power. Freq. 2-22 khz. Spl 93 db.
CE2O1O
$14.95

Philips ADO161O/T8 Dome
1OOW RMS System Power. Freq. 75O-22 khz. Spl 9O db.
CE2O13
$16.95

Pioneer Horn Tweeter
12W RMS Ferrofluid. Power Handling (6OW System). Spl 1O1 db/½W. Sensitivity Freq. 2-2O khz.
CE2O14
$11.50

Pioneer Dome Tweeter
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5OW RMS (8OW System). Spl 96 db. Freq. 5-4O khz.
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Pioneer Cone Tweeter
6W RMS Ferrofluid. Power Handling (4OW System). Spl 1OO db/½ mt. Freq. 2-2O khz.
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Peerless LK1OMDT Dome
1OOW RMS System Power. Spl 91 db. Freq. 1-2O khz.
CE2O18
$18.00

Pioneer Cone with Grill
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CE2O19
$8.95

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1OOW RMS System. Spl 92 db. Freq. 1.5-2O khz.
CE2O2O
$28.75

Novik Horn Tweeter
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Over 1OOW RMS. Freq. 4-4O khz. No Crossover Needed. Designed for flush mounting.
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PIE2O Tweeter KSN1O16
Over 1OOW RMS. Freq. 3-3O khz. No Crossover Needed.
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PIE2O Tweeter KSN1O25
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$27.00

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WAS $36.50
$18.50

MIDRANGE

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CE2O65
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Pioneer Cone Midrange 4"
6OW RMS Ferrofluid. System Power. Freq. 6OO-5 khz. Spl 99 db/½ mt. Res freq. 6OO hz.
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Plessey C13OMO6 Cone 5¼
3OW RMS 7OW RMS System. Freq. 1.2-15 khz. Spl 94 db. Res freq. 6OO hz.
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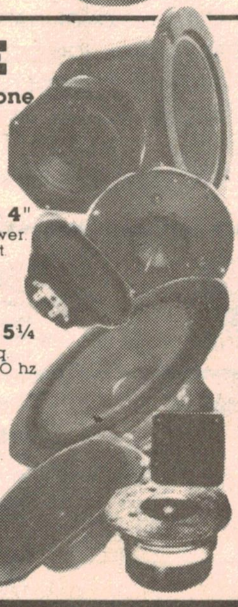
$9.50

Pioneer Cone with Grill
Ferrofluid (voice coil in a fluid). 8OW RMS System Power. Freq. 4OO-5OOO hz. Spl 1O2 db/½ mt. Res freq. 4OO hz.
CE2O78
$14.50



Pioneer White Cone Midrange
Ferrofluid. 8OW RMS System Power. Freq. 32O-6OOO khz Res freq. 32O. Spl 1OO db/½ mt.
CE2O8O
$16.00

Philips ADO21O/Sq 8 Dome
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Peerless KU45MRF Cone
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Peerless KA2ODMR Dome
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CE23OO
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15W RMS. Freq. 8O-15 khz. 4-8 hz.
CE23O3
$16.50

Foster C13OKO3 5¼"
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CE23O7
$11.95

Coral 6" 6A25
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CE2315
$12.95

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CE2318
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Novik Triaxial 6"
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CE2322
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Novik 9 x 6 Triaxial
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Full range. 1O watt 8 hz. Suitable for ceiling and PA's.
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Magnavox 8WR MK 6 8"
25W RMS. Freq. 45-15 khz. Res Freq. 35 hz. Spl 94 db/½ mt. Aust. made.
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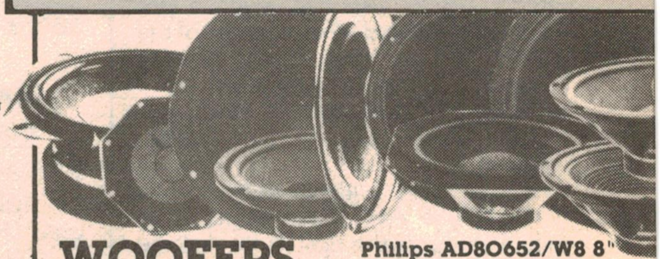
ELECTRONIC



WOOFERS

Magnavox 4" 4W
16W RMS. Freq. 65-14,OOO. Res Freq. 65 hz. Spl 92 db/½ mt.
CE21OO
$19.50

Philips 5" AD5O6O/W8
1OW RMS. Freq. 4O-3 khz. Res Freq. 45 hz. Spl 88 db.
CE21O5
$17.50

Philips AD7O62O/M8 7" Twin Cone
3OW RMS. Freq. 4O-3 khz. Res Freq. 45 hz. Spl 88 db.
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Pioneer 8" White Cone Ferrofluid
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Magnavox 8MVMK 2 8"
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CE2115
$29.00

Peerless KP825WFXPP 8"
5OW RMS. Freq. 32-2,5OO. Res Freq. 32 hz. Spl 92 db.
CE2116
$49.00

Pioneer 1O" Woofer
Ferrofluid square frame. 5OW RMS. Freq. 25-2,5OO. Res Freq. 25 hz. Spl 96 db/½ mt.
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CE2118
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Etone 1O" No 118
(Reconeable). 8OW RMS. Freq. 3O-4 khz. Res Freq. 3O hz.
CE212O
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Pioneer 12" (Ferrofluid)
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CE2121
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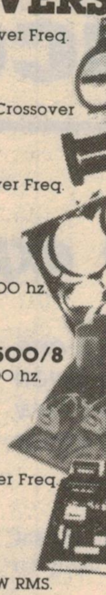
CE2350
$51.00

Etone 12" Twin Cone No 519
100W RMS. Freq. 30-12 khz. Res Freq. 30 hz.
CE2360
$59.00

CROSSOVERS



40W RMS. 2 way. Crossover Freq. 3 khz.
CE2614
$5.50

40W RMS. 3 way. 2K, 6K Crossover Freq.
CE2615
$9.95

60W RMS. 3 way. Crossover Freq. 800 hz, 5 K.
CE2616
$21.50

Philips ADF1600/8
2 way Crossover Freq. 1600 hz.
CE2617
$14.50

Philips ADF500/4500/8
3 way Crossover Freq. 500 hz, 4500 hz.
CE2620
$29.90

ETI4000/2
3 way. Xover kit. Crossover Freq. 800/3 K. 100W RMS.
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Peerless KD12OWFXPP 12"
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CE2132
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CE2135
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Etone 12" No 518
Reconeable. 100W RMS. Freq. 30-4000 hz. Res freq. 30 hz.
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Reconeable 100W RMS. No 418. Freq. 300-3.5 khz. Res Freq. 30 hz.
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Pioneer 12"
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Huge 4002 magnet.
CE2380
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Coral 8SA1
20 cm (8") 3-Way 3-Speaker System Kits (One pair)
• Speakers: two 20 cm (8") woofers, two 10 cm (4") cone squawkers, two 6.5 cm (2-1/2") cone tweeters • Impedance: 8Ω2 • Crossover frequency: 4,000 Hz, 9,000 Hz
• Output sound pressure level: 93 dB
• Program source input: 35W
• Frequency response: 70-20,000 Hz (28l Air-tight enclosure).
CE2400
$75.00 pair

Coral 10SA1
25 cm (10") 3-Way 3-Speaker System Kits (One pair)
• Speakers: two 25 cm (10") woofers, two 12.5 cm (5") cone squawkers, two 6.5 cm (2-½") cone tweeters
• Impedance: 8Ω2 • Crossover frequency: 2,000 Hz, 6,000 Hz
• Output sound pressure level: 93 dB
• Program source input: 50W
• Frequency response: 40-20,000 Hz (38l Air-tight enclosure).
CE2410
$125.00 pair

Coral 12SA1
30 cm (12") 3-Way 4-Speaker System Kits (One pair)
• Speakers: two 30cm (12") woofers, two 12.5 cm (5") cone squawkers, four 6.5 cm (2-½") cone tweeters
• Impedance: 8Ω2 • Crossover frequency: 1,000 Hz, 10,000 Hz
• Output sound pressure level: 95 dB
• Program source input: 60W
• Frequency response: 30-20,000 Hz (55l Air-tight enclosure).
CE2420
Cabinets $109.00
$175.00 pair

Peerless PAS100
100W RMS 12" Woofer Polypropylene dome midrange dome tweeter crossovers. Cabinets not included.
CE2422
$379.00 pair

Peerless PAS60
90W RMS 10" Woofer — polypropylene cone midrange dome tweeter crossovers. Cabinets not included.
CE2424
$259.00 pair

Peerless PAS25
50W RMS. 8" woofer polypropylene done tweeter crossovers. Cabinets not included.
CE2426
$179.00 pair

ETI4000/1
4 way Speaker Kit. 100W RMS. The Ultimate Cabinets not included
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3 way Speaker Kit. 100W RMs. Cabinets not included.
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Speaker Sealant
2 mts of caulking compound for sealing woofers etc against air leaks.
CE2762
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300 mm of male and female with sticky back for holding grill in place.
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$2.95

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CE2754	Brown — striped	$10.50 mt
CE2755	Brown	$10.50 mt
CE2756	Cream	$ 6.50 mt
CE2757	Brown/Gold	$10.50 mt

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Tweeter Attenuator
CE8208
Midrange Attenuator
18W RMS. (60W System Power).
CE8210
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Combined High/Mid
Level control with Leds. 18W RMS handling (60W System).
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For controlling the volume of extension speakers.
CE8204
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Mono 100 Watt Fader
For controlling the volume of extension speakers.
CE8205
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IVIDUAL SPEAKERS AND ACCESSORIES

The Serviceman

Minor components can cause expensive faults

My main story this month is one of those "how-many-faults-in-one set" kind of stories. Because all the faults appear to have been due to the same cause, it is an excellent example of just how extensive — and expensive — the failure of a couple of minor components can be.

The set in question was a Philips model K9, one of the first colour sets on the Australian market, but an excellent performer and usually highly regarded by their owners. With ordinary care, most of them still have several years of useful life ahead of them.

The set had belonged to an elderly gentleman who had recently passed away, and it had passed to his son. Quite apart from the fact that he had always been impressed by the set's performance, it was of considerable sentimental value to him. This background was, in part, the reason why he did not hesitate to have the set repaired, in spite of the cost.

Fortunately, the owner must have sensed that it was likely to be a big job, because he didn't even bother to call me to his house; he simply loaded it into the car and brought it to the shop.

NO HEATERS

I set it up on the bench, opened out for ready access, and switched it on. Two major symptoms became immediately apparent; the picture tube heaters were not alight, and the power supply began to hiccup. I switched off and decided to investigate the picture tube problem first.

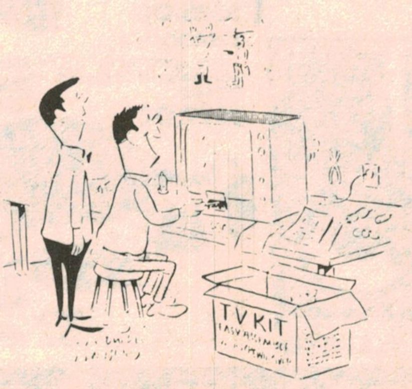
The failure could have been due to the power supply being overloaded, but experience has taught me that there could be another reason. I slid the yoke back from its normal position and examined the neck of the tube carefully. Sure enough, I found what I had feared; a tiny neat hole punched though the glass.

Since the picture tube was a write-off there was little point in delving any deeper into the set until I had contacted the owner, given him some idea of the likely costs, and giving him the option of cutting his losses or going ahead. So I sat down and added up what was likely to be needed.

A re-built picture tube would be the obvious choice, the present day Australian standard of these devices being very high indeed. The manufacturer I deal with has always offered a 12-month warranty, but now offers a four year warranty for only a few dollars extra on the purchase price.

The basic cost, to me ex-factory, would be about $120, assuming a normal glass allowance of about $80. But there would be no glass allowance in this case, because the tube was no longer under vacuum. (Unless a tube is under vacuum the factory cannot test the condition of the screen before fitting a new gun. If the screen is then found to be faulty a costly re-build exercise will have been wasted.)

This would increase the price of the tube to around $200, plus cartage, my own mark-up, and the cost of fitting the tube, which would amount to another $100 plus. So we were looking at $300 plus, with no allowance for what ever else was wrong with the set. I took a punt and rounded it off to $350; a figure which turned out to be rather conservative, in the light of what I subsequently found.



"Now if I can just pull the picture down a little, I've got it made."

Quite frankly, I half expected the figure to scare the customer off. I hadn't planned it that way, and it was a fair cost assessment, but many customers would prefer to put a deposit on a new set, and pay it off, than slap down $350 to repair an old one. But not this one. He gave an immediate go-ahead, citing his preference for the set and its sentimental value as his reasons.

FIND THE CAUSE

So I ordered a replacement tube and, while I was waiting for it to be delivered, began investigating why the original tube had been destroyed in the way it had. I had no intention of powering up the new tube while there was the slightest risk of a repeat performance. (The prospect hardly bears thinking about!)

Fortunately, I had a pretty good idea what had happened. In fact, readers may recall that I described a similar incident a few years ago (August 1980) involving a Kriesler model 59-1 chassis.

The problem involves the line output stage and, more particularly, the line output transistor, a BU208 (TS446) in this case. An essential part of this section is a pair of capacitors, in parallel, from the collector to emitter of the BU208. Their purpose is to suppress overshoot spikes which, otherwise, can generate EHT peaks as high as 50kV. It is this voltage which punches through the glass to the deflection coils.

In addition, the line output transistor invariably fails, along with any number of other solid state devices, according to the whims of the set, and the breakdown tolerances of the individual units.

In fact, this part of the set has quite a history. Early model sets were fitted with two BU108 transistors in parallel and, more importantly, only one capacitor, mounted on the printed circuit board. With only a single capacitor in this vital

position, it is not surprising that failures occurred. But, strangely enough, these were not usually due to capacitor failure, but rather to a failure on this part of the PCB.

As a result, later models were fitted with two capacitors, a .0068μF and a .0039μF or .0047μF in parallel, one in the original position on the PCB and the other connected directly across the transistor terminals.

And what had gone wrong in this case? The impossible I suppose you'd call it, because both capacitors had gone open circuit. I fitted two new ones, along with a new line output transistor, and felt reasonably confident I could energise the new tube with safety.

The tube duly arrived and was fitted and then, with fingers crossed, I switched on. Nothing much happened for a few seconds, though I sensed that we had EHT, then the screen lit up with full vertical and horizontal scan. And boy, did it light up! It was intensely brilliant; so brilliant that the beam current – and I hate to think what it was – was too much for the power supply which promptly hiccupped. I switched off.

FIRST IMPULSE

This situation was a trifle awkward. I needed to turn the set on to do any serious troubleshooting, yet I obviously had to do something to take the excessive load off the power supply. Fortunately, the K9 is fitted with a switch in each of the G2 circuits to enable unwanted guns to be shut down during the convergence procedure. I promptly switched off all three guns and tried again.

This time the power supply held in, but there was still a visible raster on the screen, which gives some idea of just how hard the tube was turned on. Nevertheless, I felt I could safely let the set run while I made some checks.

More or less from habit, my first impulse was to suspect the red, green, and blue output stages, TS305, 310, 315 (BF337). That is, until I looked at the circuit again and was reminded that it did not follow the usual pattern of later Japanese sets. These three stages drive the grids rather than the cathodes, with the luminance information being fed to the cathodes; the opposite of the common Japanese arrangement.

What was more, the three stages are capacitively coupled to the grids, these latter having their own bias network. So the problem was likely to be rather more complex than my first impulse had suggested. Nevertheless, something impelled me to check the collector voltage of each of these stages which according to the circuit, should have been at 125V.

To my surprise, all three were down to a mere 20 volts or so. Were all three stages faulty, or were they all being wrongly driven? I pulled one transistor out and checked it – it was short circuited. I checked a second one – it was short circuited. And, I need hardly add, so was the third.

I replaced all three and switched on again, not being quite sure what to expect. In fact, there was very little change. The collector voltages had risen slightly, but were still way down on the indicated value. With all three stages still in trouble the most likely suspect was their common drive unit, the chominance demodulator module, U280.

DAMAGED IC?

The easiest way to check this would have been simply to replace the module, but I did not have a spare. However, I did have a spare IC of the type used in the module (TAA630), and I was prepared to take a punt that it was the IC which had failed. And for once I was lucky; it obviously was the IC and the new one brought the three collector voltages up to normal.

But that was all it did. The raster was still too bright and there was no sign of any video content on the screen. These two facts turned my attention to the luminance chain. The luminance signal comes out of another module, U260, via pin 4, through the luminance delay line, and then to a pair of directly coupled transistors, TS291 (BC108), and TS290 (BD115).

These, in turn, feed the cathode network for the picture tube and, being directly coupled to it, could upset the bias on the picture tube if they were not functioning correctly. A few quick voltage measurements around these stages confirmed my suspicions; the collector of the BD115, which was supposed to be at 115V, was down to only a few volts, suggesting that this had also been a victim of the excessive EHT.

I pulled it out and checked it, found it was short circuit, and then checked the BC108 which proved to be similarly defunct. I replaced both transistors, wondering just how many more things I would find wrong before some video appeared on the screen. In fact, that was it; I was able to switch on the tube screens, establish normal brightness, and actually see a picture.

Granted, it was a pretty horrible picture because I had done nothing about purity, convergence, grey scaling etc, but these are routine procedures, even if a trifle tedious at times.

The purity adjustment comes first, followed by static convergence to line up the crosshatch pattern in the centre of the screen. I find that, for a new installation, the subsequent dynamic convergence can upset the static

convergence, so I content myself with a rough static adjustment the first time.

I follow this with a preliminary dynamic convergence, then go back to the static adjustments and set them up precisely. Then I go through the dynamic routine again until I achieve the best possible results. I also like to keep the set for at least a few days, but longer if possible, since I find that these adjustments, around a new tube, seem to drift a little for the first week or so, necessitating a further touch-up.

I also like to go over the set and check, and usually replace, any minor components which experience has taught me are prone to failure. The components don't cost much, and the time taken is usually minimal while the set is open on the bench, but it can save an embarrassing call-back — very embarrassing when the customer has paid out $350!

ROUTINE FAULTS

Typical of this kind of fault are three resistors in the focus chain, R510 (6.8MΩ), R512 and R513 (both 5MΩ). These tend to go high, sometimes to the point where the focus pot (R511) no longer has enough range to produce a sharp image. While none had drifted seriously in this case, all were out of tolerance and were replaced.

In this case I was lucky in that the owner was in no hurry, and I was able to keep it for a couple of weeks, letting it run on the bench most of each day. In fact, I did find it worthwhile to touch up the convergence after a while, along with the grey scale, width, height, and linearity adjustments.

In the case of these latter adjustments the need for a subsequent touch-up is not always due to any drift problems but simply to the fact the longer one "lives" with a set, the more apparent minor errors become. Were it practical, I would like to keep many sets for longer than the few hours they spend on my bench. Unfortunately, even if I could afford to do so, most people want their sets back in double quick time.

But where a customer is spending a lot of money, as in this case, he has every reason to expect that the set should perform like a new one and, provided I have the time, I do my best to achieve that.

The owner eventually took delivery, paid over his $350, and expressed himself as being very pleased with the deal, in spite of what it had cost him. For my part the charge was, as I intimated earlier, conservative. The additional labour and components involved in curing the secondary faults were a little more than I bargained for and, while I didn't lose on the job, I didn't make as much as I should have.

Which just goes to show how risky quotes can be in the service game.

On a completely different note, here is a contributed story from Mr J. E., of Bull Creek, WA. This is not J.E.'s first contribution, one of his stories appearing in the October 1982 notes. And on that occasion I made a crack about the unusual name of his home town, and speculated on what the local wags call it.

Significantly, perhaps, J.E. has chosen not to elaborate on my speculation, but he did preface his story with a short history of the town's name. It appears that, in the early days of the colony, one Henry Bull was given a grant of land which included a creek which ran into the Manning River, which is a tributary of the Swan River. So the suburb which now includes this land is not unnaturally called "Bullcreek".

Well, now we know. But I still wonder . . .

Anyway, to get back to technicalities, here is J.E.'s story.

It is about an AM-FM radio, factory fitted in a 1982 Honda Civic. The owner seldom used the radio, except to listen to the evening 7pm news on 6WF (720kHz) when returning from golf. Recently he had noticed an annoying whistle on this station which became very loud when he reached out the car window and raised the aerial.

WHISTLING LIGHTS?

One evening, on returning home, he turned off the ignition and then noticed that, when he turned off the head and side lights, the whistle disappeared. He also established that the whistle did not affect the other stations he normally used.

To me this was a real puzzle — the head and side lights of a car do not normally generate a whistle, yet the whistle and other symptoms were easily confirmed. I estimated that the whistle was around 1kHz to 2kHz, and did not change as the set was tuned through the station.

The first thing I noted was that sitting in the car, with the lights on, and touching the aerial made the whistle quite loud, but touching it when standing outside the car had no effect. So it seemed to me that the interference was originating from inside the car.

I felt that it was unlikely that the fault was in the car radio itself but, to make sure, I sat in the car with a small portable radio. As soon as I turned on the lights the same whistle appeared in the portable when tuned to 6WF.

Then came the first clue. As I moved the radio the strength of the whistle varied and was loudest with the set near the digital car clock or its wiring to the light switch. But digital clocks do not generally cause interference and, in any event, the timing section runs all the time, not just when the lights are on.

The clock had been fitted by the owner some months previously. In addition to the active and chassis leads to supply the time keeping section, it had a lead to the ignition switch which activated the display and a fourth lead to dim the display (for night driving) when the headlights were turned on.

DIMMING CIRCUIT

The display of such clocks can be dimmed by means of a series resistor but, when dimmed in this way, the brightness becomes sensitive to changes in battery voltage. An alternative approach is to use a chopper to alternately turn the display on and off. If the clock used this arrangement, the harmonics of the square wave could extend into the MF band.

Sure enough, I found an unmodulated carrier at about 10kHz intervals across the whole of the band. And, while it missed most of the local stations it did interfere with one other station; one which the owner did not normally use.

A 0.1μF ceramic capacitor across the active and chassis leads, at the clock, reduced the whistle to a point where it was not noticeable except on a very weak signal, as when the aerial was right down. A similar capacitor fitted to the dimming lead had little effect — presumably because it was only a control wire and did not carry the chopped current. To have eliminated it completely could have proved a tedious job; possibly including shielding the clock itself.

The reason the owner had not associated the whistle with the clock installation was probably because it had been fitted at the beginning of summer when he drove home without the headlights.

Thank you J.M. for a most intriguing story. It would be interesting to know whether anyone else has ever encountered a similar problem. In regard to the means and degree of suppression, I can only add that, had it proved more stubborn, an RF choke of some kind, in each lead, plus the capacitors, may have been worth trying.

If you have a factual and interesting story to tell about electronic servicing, write it in your own words and sent it to "The Serviceman", c/- "Electronics Australia", Box 163, Chippendale 2008. If the Serviceman uses it in his column, we will pay an appropriate fee.

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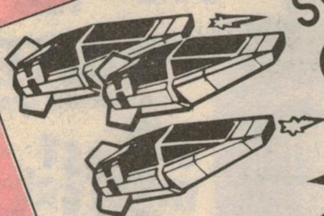

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Circuit & Design Ideas

Interesting circuit ideas from readers and technical literature. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. As a consequence, we cannot accept responsibility, enter into correspondence or provide constructional details.

Extra RAM for the DREAM 6802 microcomputer

For readers with the 6802 version of the popular DREAM 6800 first published in May 1979, this simple circuit modification will provide an extra 128 bytes of RAM for the cost of four diodes and a resistor. Basically new address decoding is applied to the existing RAM to shift these locations from the original position of 0000 to 03FF to a new position of 0080 to 047F. The 128 bytes of RAM internal to the 6802 MPU are then enabled which occupy the lower locations from 0000 to 007F. This modification in effect provides a 1K memory with 128 bytes tacked on top.

The modified memory decoding circuit is inserted between the VMA line and the input to IC10b, pin 5. Note that the circuit diagram on page 84 of the May '79 issue shows this connection incorrectly as pin 3. This should be corrected to pin 5. The previously unused two input AND gate pins 4 and 5, of IC12 are brought into service; pin 4 connects to the VMA line and the output, pin 6 to pin 5 of IC10b.

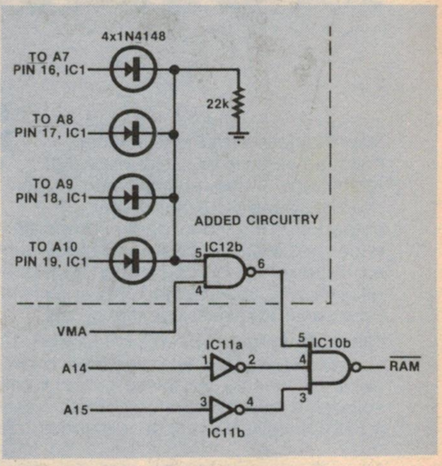
The second input, pin 5 of IC12B is connected to a four input OR gate consisting of four diodes which connect to address lines A7 to A10. When any of these address lines is high so is the output of the OR gate and pin 5 of IC12B is held high. If the VMA line is also high, the output of the AND gate goes high. The RAM signal is then present on the output of IC10b provided the address lines A14 and A15 are low which in turn produce high outputs from inverters IC11a and IC11b.

The 22kΩ resistor at pin 5 of IC12b holds the input low if the addresses from A7 to A10 are all low.

When A7 only is high, the 1K RAM is enabled for addresses 0080 to 00FF. With A8 high, addresses from 0100 to 01FF are enabled. A9 high enables addresses from 0200 to 03FF. A10 high enables addresses from 0400 to 07FF, however, in this case we are only interested in the address decoding to 047F.

The remaining modification required is to enable the RAM on the 6802 MPU. This is internally decoded to be located at the addresses from 0000 to 007F. All that is required in this case is to bring the RAM ENABLE, pin 36, high rather than the original ground connection.

The diodes can be located near the A7 to A10 address lines by drilling component lead holes near to the MPU pins. The cathode sides of the diodes link to pin 5 of IC12b with an insulated wire link. The 22kΩ resistor can be located alongside the IC12 IC, one lead to ground and the other lead to pin 5. Since pin 1 of IC12a is connected to the VMA line, this is a convenient point from which to take the VMA for pin 4 of IC12b.



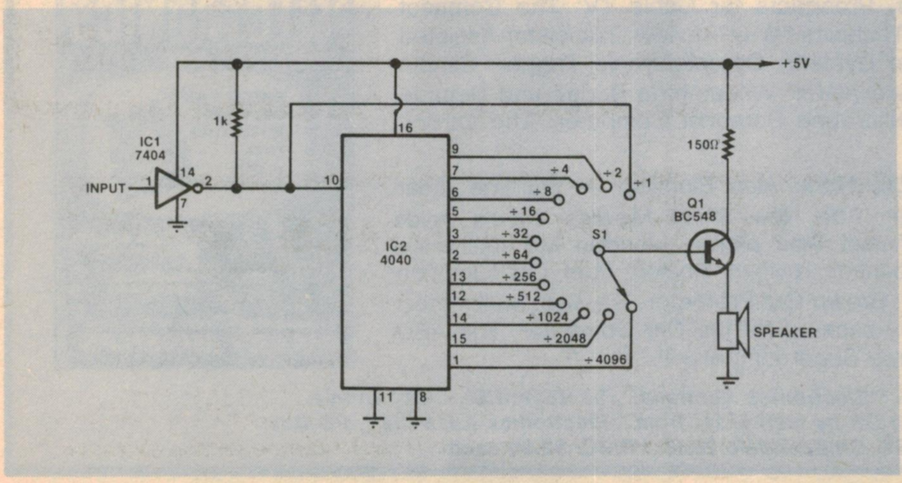
The copper track at pin 5 of IC10b should be broken from the VMA line with a sharp knife and a wire run from pin 6 of IC12b to pin 5 of IC10b. The final modification is to cut the connection from the RAM ENABLE, pin 36 of IC1 (the MPU) and ground. Pin 36 should now connect to the positive 5V rail. Suitable points are the MR, pin 3 and the Vcc pin 8.

M. Hodges,
Aspendale, Vic.

Digital clock monitor with audible output

When servicing digital equipment it is sometimes only necessary to know whether a clock or gate is producing an output. This can easily be determined by using the accompanying test circuit to "listen" to the suspect circuit.

The problem of listening to frequencies which are above audibility is overcome by selectable orders of frequency division. As shown it can divide by up to 4096 times, thus dividing a 5MHz signal to a mere 1220Hz.



The output under suspicion is fed into a 7404 TTL inverter (IC1). This ensures that the signal is within TTL levels and also provides some static protection for the following 4040 CMOS counter. The counter divides the signal, as already explained, and the upper limit is set by its speed (about 5MHz for the 4040).

This could be increased by adding a 7490, 7492, or 7493 TTL counter to the 4040 input to extend the limit to about 50MHz.

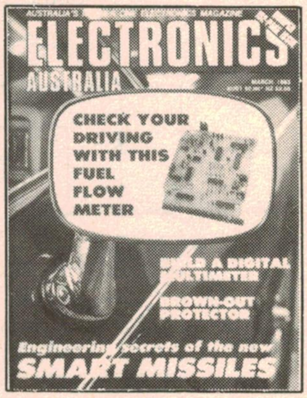
Output from the 4040 is fed to the base of a small transistor (BC549, etc) which drives a speaker. The level can be adjusted by varying the 150Ω resistor.

D. Timmins,
Pullenvale, Qld.

DID YOU MISS AN ISSUE?

FEBRUARY 1983: The growing peril of Space Debris; Prospects for Cable TV; The Compact Disc; Technics "Way" review; Transistor Assisted Ignition System; Optoelectronic Trigger; Simple Moisture Alarm; Wheatstone Bridge and Decade Box; Microbee Personal Computer; The Otrona 512.

MARCH 1983: Alan Blumlein — Wartime radar pioneer; The New Smart Missiles What's inside a Compact Disc player; Meridian M3 Interactive loudspeaker review; Analog Fuel Consumption Meter; Brown-Out Protector; 3½ Digit Multimeter; Battery back-up for the Car Computer; The AED Universe Supercomputer II.



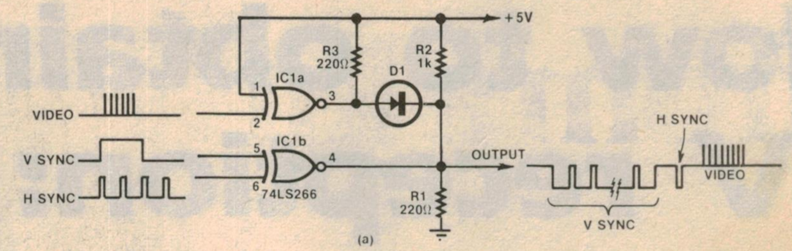
Available from "Electronics Australia", 57 Regent St, Chippendale. PRICE: $2.00 each OR by mail order from "Electronics Australia", PO Box 163, Chippendale 2008. PRICE: $3.00 each.

Composite video signal generator using NOR gates

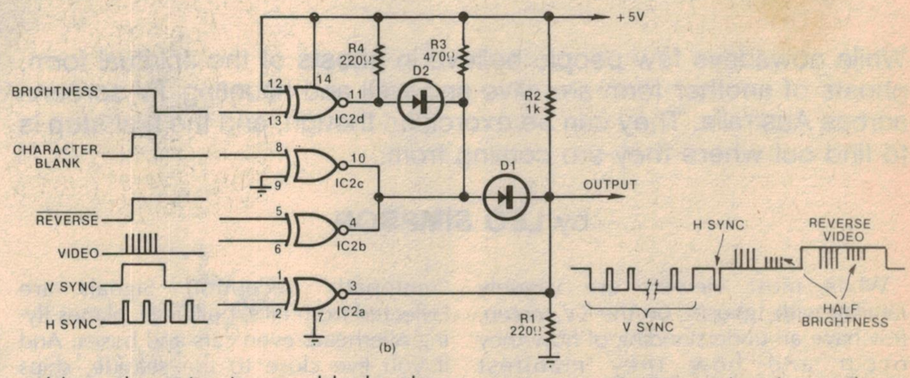
Obtaining a composite video signal, as for a computer display, using discrete components, is a difficult task. However, exclusive-NOR gates having open collector outputs and TTL compatibility solve the problem since they eliminate the need to bias high-speed transistors or to interface digital and analog devices in systems where only character or graphics information is used.

The circuit (a) produces a quality composite video signal. The current through resistor R1 determines the output voltage. When the sync pulse appears at the input, gate IC1a pulls the output to ground. During the display portion of the horizontal scan, the black output level of 0.25V results when the output of gate IC1b is held low. This voltage shunts the current through R3. When the output of IC1b is high, the current from R3 passes through diode D1 to increase the voltage across R1 to 1V – the colour white on the cathode-ray tube.

Additional features may be incorporated in the design as shown in (b). Reverse video is obtained by supplying a logic 0 to the input of IC2b when characters are displayed. Also, tying the outputs of IC2b and IC2c together enables the circuit to blank the characters. In addition IC2d helps switch the character brightness between two levels. When the output of IC2d is high, the current through R4 increases the amplitude of the video-dot voltage across R1. The low output impedance of this circuit is compatible with the 75-ohm input of standard video displays.



(a)



(b)

"Electronics", October 6, 1982

Heavy-duty joystick for the VIC-20

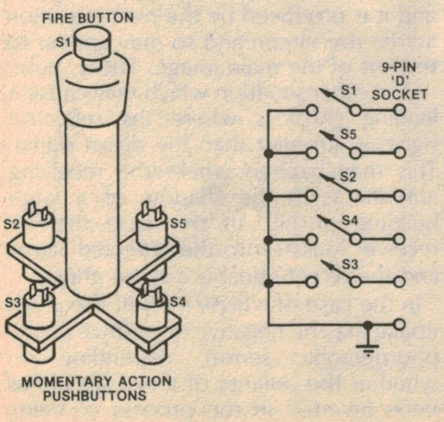
If you need a joystick for use with a Commodore VIC-20 computer, here is a design for a simple, robust version which can be made from quite ordinary components.

It is constructed from dowel rod, two small strips of wood, five momentary action push buttons, and a plastic leg cap from a chair. As shown in the diagram, the two pieces of wood are made into a cross, with a switch at each of the four extremities.

The dowel forms the joystick proper, with the fifth push button as the fire button at the top set in the plastic leg cap. The wires from it can be taped to the outside or run through a hole down the centre, if this can be arranged.

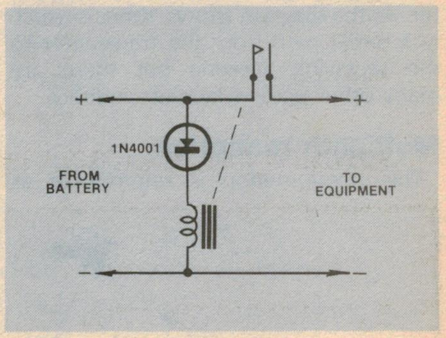
The wires from all five switches are interconnected as shown and terminated in a "D" type plug to match the "D" socket on the computer. Exact wiring details to suit the "D" socket are given in the Commodore VIC-20 handbook. The joystick is operated by placing it on a flat hard surface and pushing lightly in the desired direction.

P. Campbell,
Bondi Junction, NSW.



Reverse polarity protection circuit

Portable equipment, such as transceivers, TV receivers etc, designed for use with 12V car electrical systems, require some form of protection against reversed battery connection. One simple arrangement is a diode in series with one lead, and this is completely effective but has the disadvantage that between 0.6 and 1V can be lost across the diode.



This can be avoided by connecting the diode across the input terminals, with suitable polarity, so that it blows the fuse with reversed connection. This is effective and does not introduce any loss, but the blown fuse can be very inconvenient.

The following approach has neither disadvantage. A relay is connected across the input terminals, in series with a diode, so that it operates only with correct connection. The main circuit to the equipment is then wired via the relay's normally open contacts.

R. Pointing,
Redbank Plains, Qld.

How to obtain better TV reception: Pt. 2

While nowadays few people believe in ghosts of the spiritual form, ghosts of another form are alive and well and haunting TV screens across Australia. They can be exorcised though, and the first step is to find out where they are coming from.

by LEO SIMPSON

While most viewers are vaguely familiar with "ghosts" on the TV screen, few have an understanding of how they occur and how they manifest themselves. It may come as a surprise to learn that they may not simply appear as a faint image but can have other symptoms.

What causes a ghost? Well, as Fig. 1 shows, ghosts are due to signals which arrive at the receiving antenna via a different path to that of the main and usually strongest signal from the TV transmitter. As the diagram shows, there is usually a direct path from the transmitter to the receiving antenna but there are many other paths which are indirect.

Multipath reception

This phenomenon is referred to as "multipath" reception. Signals are reflected from hills, buildings, planes flying overhead, even cars and buses. And if you live close to the seaside, ships moored off the coast are a very effective source of ghosts! Multipath reception also affects FM reception causing audible distortion, especially in the stereo mode.

So how does the ghost become visible? There are two conditions which must be satisfied before a ghost will become apparent on the screen. First, the time delay due to the different path of signal reception must be about one microsecond or more. (Smaller delays can be visible as we will describe later.)

Second, and more importantly, the strength of the ghost signal as fed to the TV set's antenna terminals must be less than about 45dB down compared with the main signal. To explain this, for a first class picture which is completely free of any graininess (noise) or interference, the signal must be at least 45dB above any noise or interfering signal (ie, the input voltage to the antenna terminals must be 178 times stronger).

While this sounds like a pretty tall order, we can qualify it by saying that ghost signals which are around 30dB or more down on the main signal will not be apparent most of the time, unless you know what to look for.

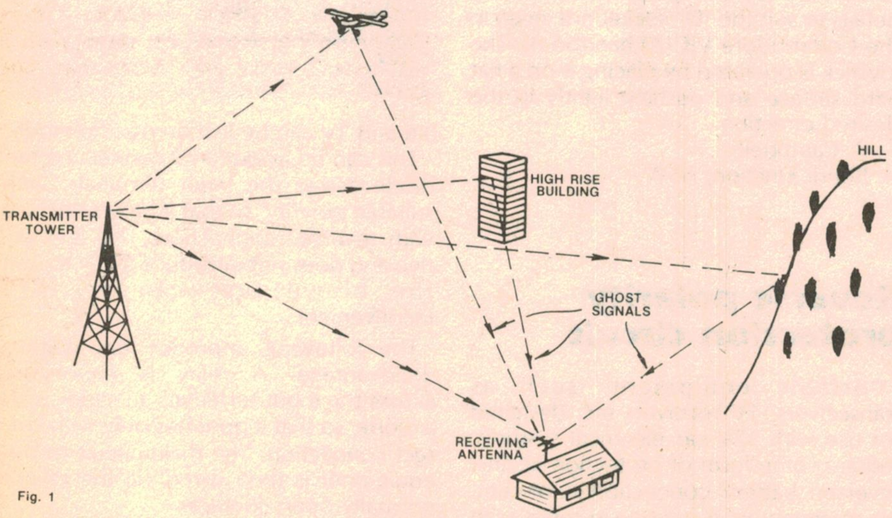


Fig. 1

Ghost signals can take many different paths to arrive at the antenna. Aircraft cause ghosts to move and flicker rapidly.

How do ghosts appear on the screen?

While the answer to that question may seem obvious, it is not. Generally a strong ghost signal will appear as a faint image displaced to the right of the main image on the screen. Under some conditions though, the ghost image may appear to the left of the main image and in this case it is known as a "leading" ghost. A commonly cited reason for this is that the antenna lead-in wire is long and poorly shielded and is therefore picking up a weak signal which arrives at the TV set antenna terminals before the main antenna signal. However, there is another way in which a "leading" ghost may occur and that is that the ghost signal may be delayed so long that it arrives after the electron beam has completed a transition across the screen.

In this case it is really a "trailing" ghost and it is produced by the next transition across the screen and so may appear to the left of the main image. Tricky, huh?

One other situation which may cause a leading ghost is where the reflected signal is stronger than the direct signal. This may happen where the receiving antenna is in the shadow of a large building or hill. In this case the TV receiver locks on to the reflected signal and the direct signal is a weak ghost.

In the case of a B&W TV set, the ghost image may be negative or positive (in the photographic sense), depending on whether the polarity of ghost signal has been inverted in the process of being

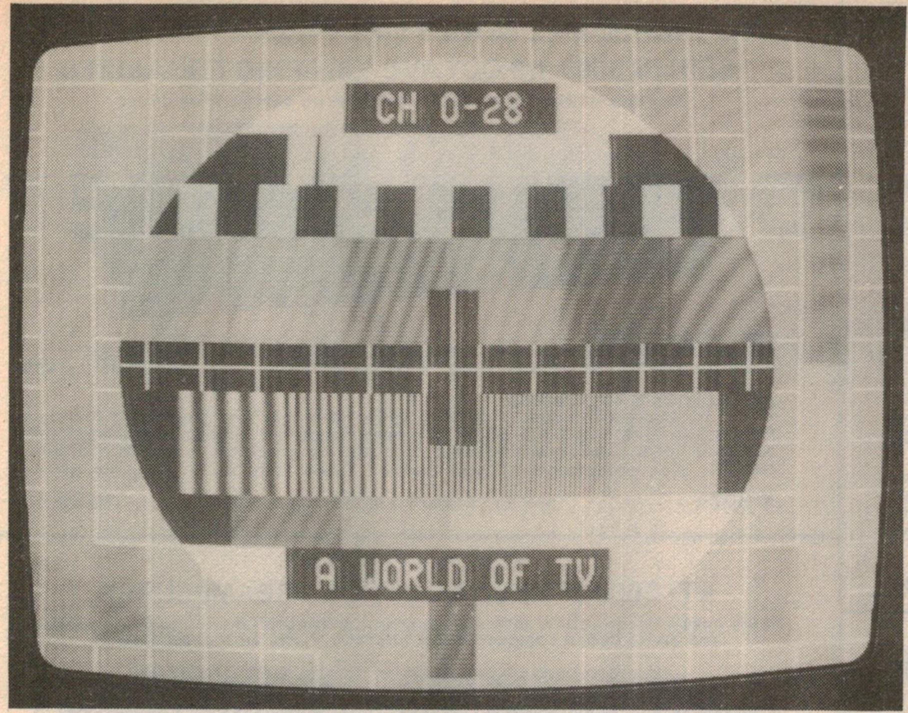


Photo A: Often ghosting may not be readily apparent on a test pattern. This was taken with the brightness control advanced to highlight ghosting.

reflected (which changes the phase of the RF carrier).

On colour sets though, due to the PAL method of transmission, the ghost will appear as a faint positive or negative image which "desaturates" any solid background colour on which it is superimposed.

So where reception is plagued with ghosts there will not only be faint multiple images but the picture will appear to be generally "washed out".

Sync pulse ghosts

In some instances ghost images may not be readily apparent at all but you may observe a faint vertical line on the screen which does not bear any relationship to the picture information. This vertical line is the "ghost" of the leading edge of the horizontal sync pulse. Closer examination, perhaps after critical adjustment of the contrast control, will usually reveal another faint vertical line which will be about one-tenth of the screen width to the left of the first vertical line. This is the trailing edge of the sync pulse. The vertical band between the two lines will slightly darken or lighten the colour background on which it is superimposed. This effect is most readily apparent on weather maps. We can extend this description by remarking that the horizontal blanking period may also appear as additional vertical lines outside the sync pulse lines.

The reason why a sync pulse ghost may be visible when other ghost images are not readily apparent is that, as depicted in Fig. 2, the sync pulse represents about 30% of the total amplitude of the composite video signal. Also shown in this diagram is a ghost signal which would produce a positive ghost image. Fig. 3 shows the same composite video signal together with a ghost signal which has been inverted in polarity to produced a negative image. Photo B shows a picture where a sync pulse ghost is evident but with no other ghost image.

Aircraft flutter

Aircraft produce some of the most readily apparent and irritating ghost effects. They are very efficient reflectors of TV signals and the fact that they are flying rapidly makes the ghosts flicker in and out of visibility and also traverse the screen. In addition, flying aircraft will modulate the amount of colour saturation in the sync pulse ghost band and if two such vertical bands are present they will be seen to rapidly alternate between light and dark.

In really severe cases, with a large aircraft flying low and directly overhead, the interference from the ghost signals can be so bad that the TV set may momentarily lose vertical hold. In most cases though, the aircraft causing this pictorial havoc will be so far above that they cannot be heard inside the viewing room! So people on airport flight paths have another reason to gripe.

Note that while aircraft may cause interference to television reception because they act as an efficient reflector of TV signals, they do not cause interference directly by any RF signals they may radiate.

So ghosts can be a real problem and lessen the pleasure of watching otherwise first-class program transmissions. But there is often a great deal which can be done to reduce the incidence of ghosts. Even aircraft flutter effects can be minimised, as we shall see later in this series.

On the negative side though, let us decry that "off the cuff" statement made by some TV servicemen or retailers hurriedly installing a new set that "the ghosts will disappear" if the antenna is rotated to the right direction. Often, there is no "right" direction, particularly if you have to deal with more than one ghost.

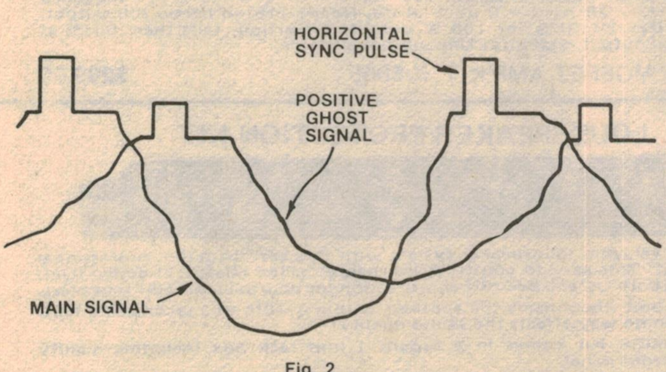


Fig. 2

This diagram shows the timing relationship between the main signal and a reflected signal producing a postive ghost image.

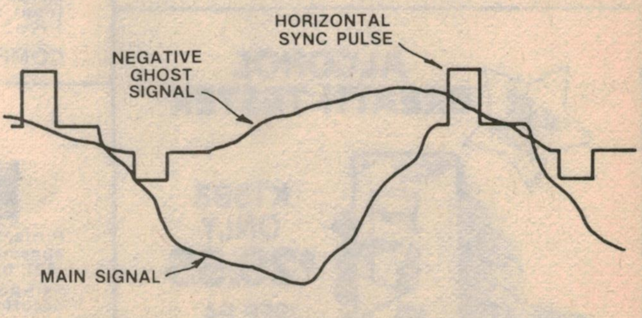


Fig. 3

This diagram shows the timing relationship between the main scanning signal and a ghost signal which produces a weak negative signal.

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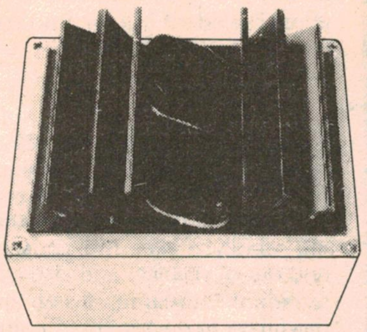

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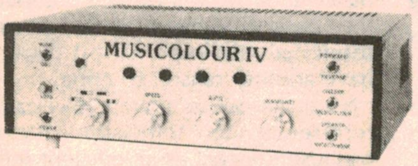

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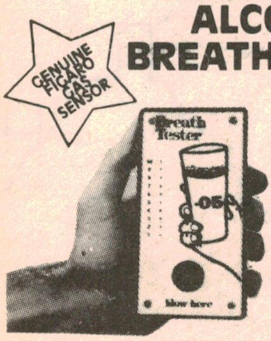

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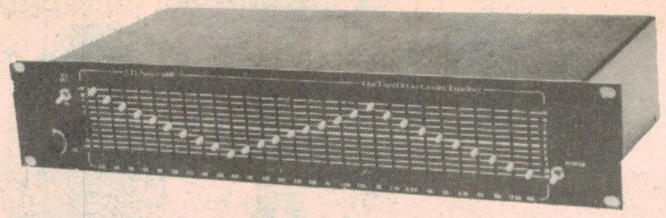

SPECIFICATIONS:
Noise — at zero gain and 20 KHZ Bandwidth — 102 db. **Distortion 1 KHZ** — typically .007%. **Bandwidth** — 12HZ — 105 KHZ + 0 — 1 db. **Boost/Cut** + and — 14 db.

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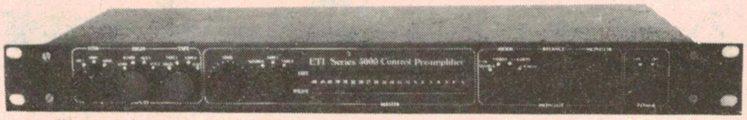
There have been countless accolades exclaiming this brilliant design by Australia's top audio design engineer David Tilbrook — and with good reason!



As a demonstration of our faith in this classic designed preamplifier we proudly release the **STUDIO FORMAT 5000 PREAMP** which includes some very worthwhile refinements as detailed here:—
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SPECIFICATIONS: Power Output: 100 watts into 8 ohms x 2. **Frequency Response:** 8 HZ - 20 KHZ + 0 db — .4 db. **Noise:** 116 db below full output. **Input sensitivity:** 1V RMS for 100 W output. **Distortion:** Less than .001% at 1 KHZ and full output. **Stability:** Unconditional stable.

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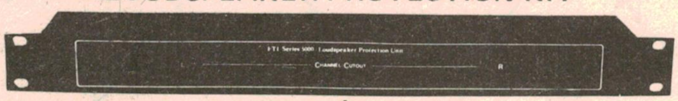

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EXCLUSIVES: ★ LED Monitoring of channel cutout ★ Fujitsu 10 amp relays ★ ALTRONICS Kit, stereo unit complete to last nut bolt and washer ★ Input/Output speaker cable terminals supplied.

Install it in minutes — no AC or DC connections required — simply connects into the left and right channel speaker lines.

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Photo B: The faint vertical bar about one-tenth of the width of the picture is the ghost of the horizontal sync pulse. In most cases it is darker but it may also be slightly lighter than the rest of the picture.

The first step you can make to eliminate a ghost is to determine where it comes from and this you can do without going anywhere near the antenna. You can do it by taking measurements from the TV screen, making a simple calculation and then referring to a map of your area.

Measuring your ghost

The idea behind this exercise is to calculate the time delay between the ghost and the direct signal from the transmitter. It is then possible to calculate the difference between the path taken by the direct signal and the ghost signal. Having done that, refer to a map to determine which landmark is likely to be causing the reflected signal.

The first part of the exercise is to actually make the measurement. Ideally you should use a dressmaker's fabric tape measure which can conform to the curvature of the screen and is not likely to scratch the screen or mask surround. (Watch the metal ends though. Scratches on a TV screen may eventually lead to tube implosion.

Making the measurement is not really as easy as it sounds. While the ghost may be all too obvious at your normal viewing distance, it may be all too nebulous when you are close to the screen and the task is complicated considerably if the image is moving or constantly changing.

And while a test pattern may be ideal for judging many picture parameters, it is not the best for ghosts, unless they have a short delay. The best picture for ghost delay measurement usually occurs during news bulletins where sports scores are shown on a solid colour background. You may have to adjust the brightness and contrast controls to highlight the ghost.

Even so, you will have to make the measurement quickly, before the picture changes.

Okay. So you have measured the distance across the screen between a point on the main image and the respective point on the ghost image. Let's say that the measurement is 60mm. Now you have to determine the overall width of the picture and because most sets have some degree of overscan, this will be wider than the physical width of the screen.

The degree of overscan can only be judged by looking at the screen when it is displaying the Philips PM5544 test pattern or an equivalent pattern which has a graticule. Note that the edge castellations of the Philips test pattern are not taken into account in measuring the screen width. If you can adjust the width, reduce the overscan so that picture width can be measured precisely. In most sets which have no preset width control the overscan is usually about 5%.

So, for example, a 48cm diagonal screen will have a screen width of 41cm and an actual picture width of about 43cm (ie, about 10mm overscan on each side).

At this stage then, we have a ghost measurement of 60mm and a picture width of 430mm (for a 48cm screen diagonal). The actual time taken by the electron beam to trace across the picture is 52 microseconds. To find the delay time of the ghost we divide 60 by 430 and multiply by 52(μs) to give a result of 7.25μs.

How to obtain better TV reception

The signal path difference is obtained by multiplying the time delay by the speed of light (300,000km/sec or 300m/μs) to give a result, in our example, of almost 2.2km.

Now remember that this distance of 2.2km represents the extra distance that the ghost signal has travelled in arriving at the antenna. It could, for example, have been produced by a hill or building 1.1km immediately behind the antenna (or behind the transmitter). But there are an infinite number of points on an elipse which can satisfy the condition of 2.2km extra signal path. To draw this elipse you will need a large road map.

Lay the road map out on a large piece of scrap plywood or cardboard and fix it in place with a few strips of adhesive tape. Now accurately mark the site of the transmitter tower and your antenna with drawing pins. Note the scale of the map and attach a piece of string to the two drawing pins which is exactly 2.2km longer than the distance on the map between the transmitter tower and the receiving antenna.

By placing a pencil in the loop of string so formed, it is possible to draw an elipse with centres at the transmitter tower and the receiving antenna. If you can use the trammel method to draw a more accurate elipse, well and good, but the pencil-and-string method is good enough for this purpose. Fig. 4 shows how the elipse would appear and any large building, structures or hills lying on the path of that elipse could be the source of your ghost.

Of course, if you have more than one ghost and more than one TV station, the process should be repeated to find all possible ghost sources for all stations. This could turn out to be a complete can of worms but usually, even if you have a bad case of ghosts, you will end up with two or three major sources. In the author's case, for example, there is a water tower some 200 metres away, a high ridge behind the antenna about two kilometres away and an even higher ridge some six or seven kilometres away. The last source produces a long duration ghost while the first produces a very short (about 0.5cm on screen) duration ghost which produces a slight halo effect around images. In fact, this halo effect could easily be mistaken as a symptom of "ringing" in the video circuitry of the set.

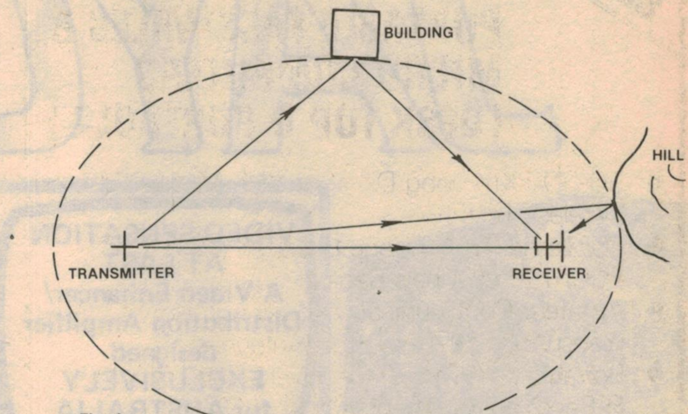

Fig. 4

The ellipse represents the locus of all possible points which may produce a given time delay for a ghost appearing on the screen. It should be plotted on a large and accurate map.

The example quoted above is really a fairly easy one to plot, but if you are a long way from the transmitter and the ghost distance is relatively short you will require a large scale map and accurate work to be able to pinpoint the ghost. And remember, as Fig. 1 shows, the ghost may be a reflection from behind the antenna or may result from the signal glancing off a large building or structure almost in line with the transmitter.

In this latter case you are really stuck with it and nothing can be done, short of moving house.

Conclusion

In telling you in some detail how multipath reception appears on the screen we have appeared to have given no clues at all on how to get rid of ghosts. Well, there are a few clues here but you need to know about the directional characteristics of the different types of antennas before you can decide which one suits your purpose.

Next month we shall discuss the principles of antenna operation and talk about specific types, such as yagis and log-periodics.

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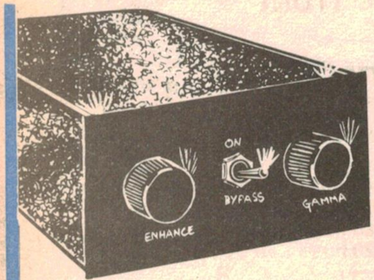

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BASIC	Interpreter	More than 90 instructions stronger than those for Apple II
Video	Type	Memory mapped into system RAM
Display	Mode	Text, low-resolution graphics, high resolution graphics (3 modes are mixed)
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	Character Set	Upper case ASCII, 64 characters
	Character Type	5 x 7 dot matrix
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Keyboard		49 alphanumeric and function keys
Cassette	Interface	Use various cassette tapes and cartridges
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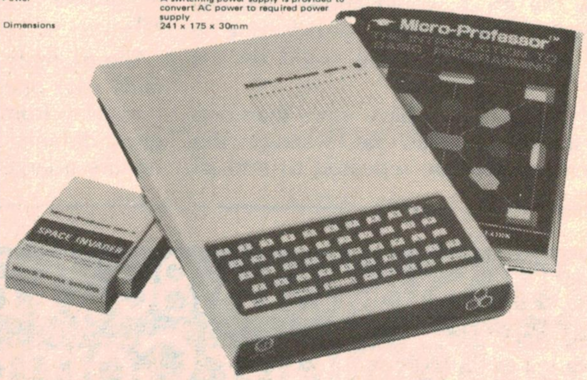

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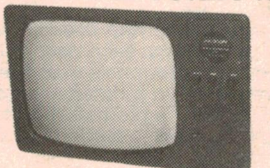

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Build this simple fridge door alarm

Do you have household members who hold the refrigerator door open longer than they should? It's always a temptation — especially for children — to hold the door open whilst deliberating over chocolate cake, ice cream, soft drink or various other non-nutritional products.

By COLIN DAWSON

When the refrigerator door has been left open for about 20 seconds – or, more correctly, when the light has been on for 20 seconds – this EA Fridge Alarm will emit a series of reminder beeps until the culprit closes the door.

A major advantage of making the device light-activated is that it is therefore completely self-contained; it does not need to be connected to the electrical wiring of the refrigerator. Another advantage is that it makes it difficult for the "smartie" to circumvent the alarm. There is no on-off switch and the natural impulse to snatch the alarm out of the refrigerator achieves nothing; it will remain triggered by the ambient light.

(If the door has to be held open legitimately for a long period, as when cleaning the refrigerator, the simplest approach is to pop the alarm into a drawer.)

Mind you, we would assume that any economy-minded EA reader will have already tilted the fridge back slightly so that the door closes automatically once it is left. This avoids the necessity of yelling at wife and kids to "close the blankety-blank fridge door."

The sound is actually provided by a piezoelectric transducer which is quite compact and remarkably efficient. The whole circuit has a quiescent current of only 4μA and even when sounding the alarm draws less than 400μA.

The transducer first came to our attention as part of the Voyager car computer, where it is used for a number of aural warnings. Similar devices are used in electronic clocks and watches.

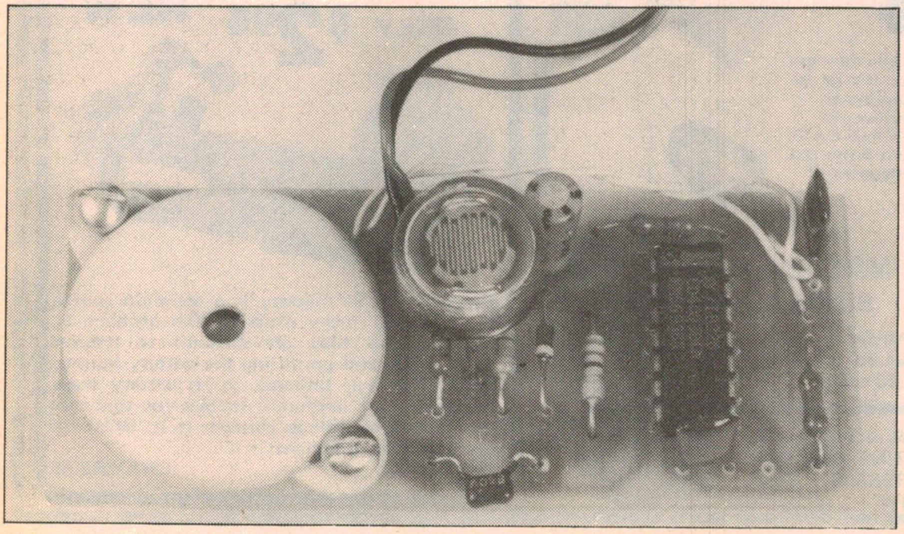
The plastic encapsulation of the transducer has two integral mounting lugs and the whole package is about the size of a 50 cent coin. It is manufactured by Toko and should be available through major kitset suppliers at about the time this issue goes on sale.

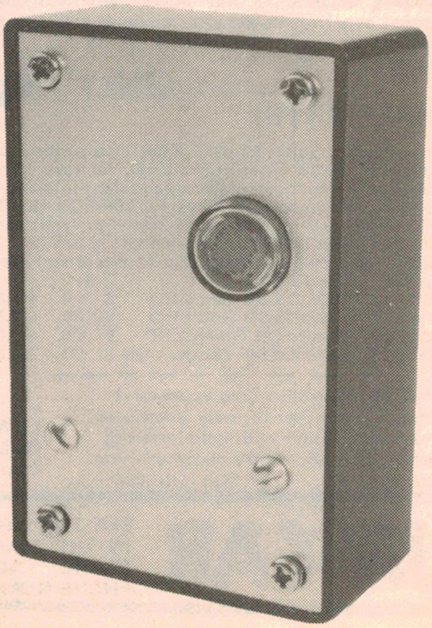
In the Voyager car computer, the transducer has a quite pleasant chime sound. Controlled by the microprocessor, the waveform has a rapidly decaying amplitude after an initial high level. Because we wanted to design the circuit with only one IC, it was not possible to duplicate this effect.

Two oscillators

On the other hand, a single tone is not as attention-getting as might be desirable, so we provided for a more complex sound by feeding the transducer with signals from two oscillators operating at different frequencies. This sound is then switched on and off by means of a third, low frequency, oscillator, giving a succession of beeps.

Below is a view of the assembled PCB while at right is the prototype housed in the optional plastic zippy case. Power is supplied by a 9V battery.





Although the project has been designed to fit into the smallest size "zippy" box, a box is not at all essential. In fact, we simply put the project in a sealable plastic "zipper" bag. This prevents condensation from interfering with the operation of the circuit, without diminishing the effect of the buzzer.

Depending on the frequencies chosen for the first two (signal) oscillators, the alarm can be given a simple digital clock style beep, or a somewhat more dramatic "emergency" style warning.

In normal circumstances putting a battery power supply in a refrigerator would be a questionable practice – the performance of the battery might be reduced to such an extent that circuit operation might be prejudiced. However, tests have confirmed that no problems will arise with this circuit, since it has such a low power consumption. In fact, the battery can be expected to last for at least its shelf life, depending on how often the alarm is triggered. This should give a service life measured in years.

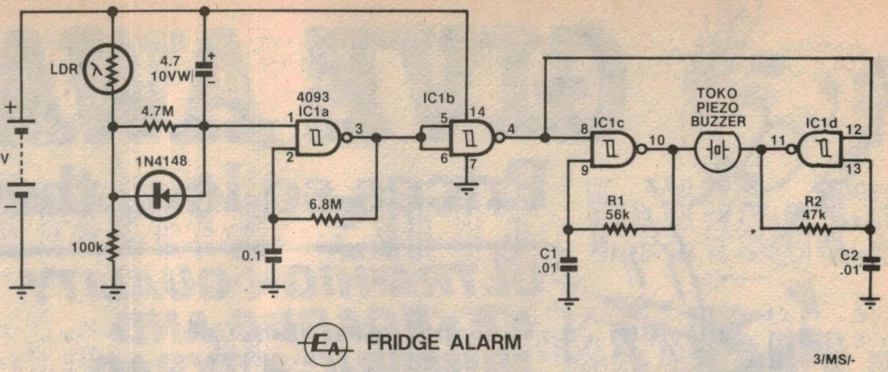
Most refrigerators have an internal light which is activated when the door is opened. This is used to trigger the circuit by means of an LDR (light dependent resistor). In cases where no such light is fitted, the ambient light will usually be sufficient to trigger the alarm.

We have used a 20 second delay between the light coming on and the alarm sounding and this is probably a realistic period. However, it can easily be altered to any period between zero and a few minutes. In fact, this aspect of the circuit's operation gives it the potential to be adapted to "egg timer" applications.

By replacing the LDR with a switch, the alarm would wait for the predetermined period after switch on and then sound the reminder until switched off.

The Toko transducer appears to be most efficient at about 1.5kHz, suggesting that this would be the ideal operating frequency. Since it has more than sufficient volume for the application, however, some may prefer to sacrifice some efficiency in favour of a more pleasant tone.

While there are several ways in which the output of the two signal oscillators could be mixed and applied to the transducer, we found the simplest arrangement was to connect the transducer between the two oscillators.

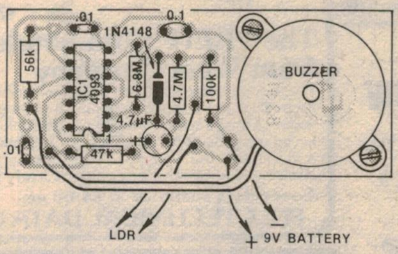


The circuit is triggered by the LDR while IC1c and IC1d drive the buzzer.

PARTS LIST

1 Printed circuit board, 32 x 75mm, code 83al6
1 Light dependent resistor (LDR)
1 Miniature piezoelectric transducer (Toko PB-2720 or equivalent)
1 9V battery (Eveready 216 or equivalent)
1 Battery snap connector to suit
1 Plastic box 28mm × 54mm ×83mm (optional)
1 4093 CMOS quad two input Schmitt NAND gate IC
1 1N4148 diode
1 4.7µF/10V electrolytic capacitor
1 0.1µF monolithic capacitor (see text)
2 .01µF greencaps (see text)

RESISTORS (¼W, 10%)
1 × 6.8MΩ, 1 × 4.7MΩ, 1 × 100kΩ, 1 × 56kΩ, 1 × 47kΩ



Check the polarity of the IC, diode and electrolytic capacitor before soldering them into place.

Circuit details

Operation of the circuit is quite straightforward. The oscillators and trigger circuitry are provided by a 4093 CMOS quad NAND Schmitt trigger IC. Each NAND gate in the package has two Schmitt trigger inputs. This differs from the normal NAND gate in that there is defined hysteresis in the triggering levels, ie, triggering on an upwards transition occurs at a different level to triggering on a downward transition.

The difference in triggering levels is typically 2V with a 9V supply. Although the advantage of this hysteresis may not be immediately apparent, it enables a considerable saving in the number of gates required.

The logic conditions for any NAND gate are such that the output is low only when both inputs are high. For any other combination of inputs, the output will be high.

This allows us to use any one input pin as a control. Taking this pin low effectively inhibits the gate because the output will always be high regardless of what happens to the other input. In fact, IC1a is used in exactly this way with pin 1 serving as the alarm control.

The control voltage is actually derived from a voltage divider consisting of the LDR and a 100kΩ resistor. When little or no light falls on the LDR its resistance is high (hundreds of kilohms or even megohms). This means the voltage at the divider tap is low.

When the refrigerator door is opened and the LDR is subjected to a relatively high level of light, its resistance will fall to a few hundred ohms. Consequently, the control voltage will rise and eventually exceed the gate threshold of IC1a.

Rather than couple the control voltage directly to pin 1, it is first passed through a delay network consisting of a 4.7MΩ resistor and a 4.7µF capacitor. About 20 seconds after the light is switched on, the voltage on pin 1 will exceed its positive threshold and IC1a will be gated on.

This condition represents the triggered state for the alarm. When the refrigerator door is closed and the alarm condition no longer exists, we want the alarm to cease immediately. This means defeating the 20-second delay, and this is achieved by the diode across the 4.7MΩ resistor.

A charge path exists through this diode

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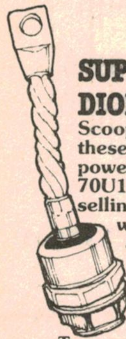

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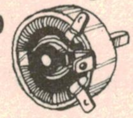
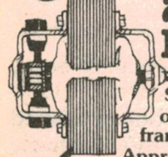


240VAC Motor



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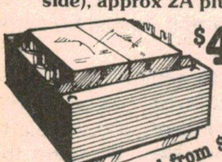

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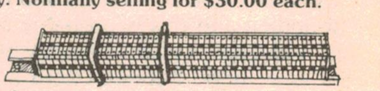

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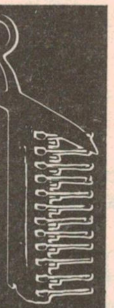

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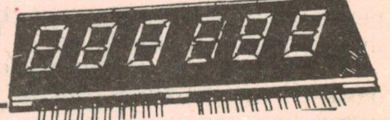

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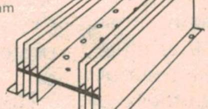

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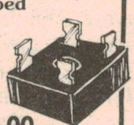

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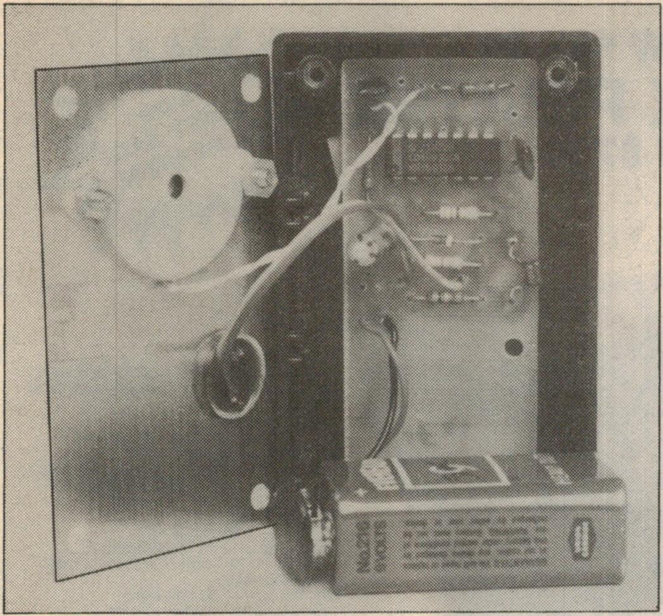
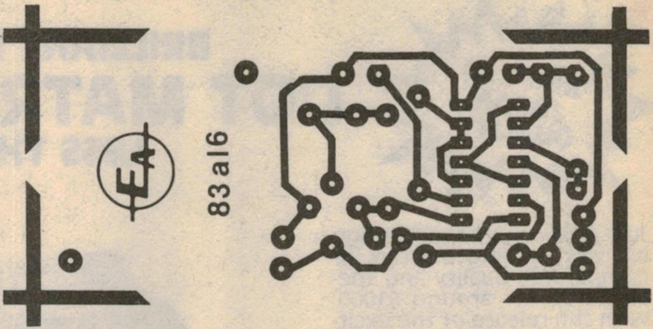


LEFT: This view shows how the parts are mounted in a plastic zippy case.



Above is an actual-size reproduction of the PCB artwork.

We estimate that the cost of parts for this project is approximately

$9

for the PCB version. This includes sales tax.

and the 100kΩ resistor which means that charging occurs much more rapidly than discharging. Due to residual charge of the 4.7μF capacitor, the delay period will be less than 20 seconds for some time after an alarm. For example, closing the refrigerator door during an alarm will silence the alarm immediately, but if the door is opened straight away, the delay may be only three or four seconds. The delay period will increase as long as the door is closed, reaching its full value after about one minute.

Pulse oscillator

The role of IC1a is as a modulation gate or pulse oscillator, which breaks up the tones of the signal oscillators into a series of beeps. When its pin 1 goes high, as just described, its output (pin 3) goes low (which turns on the signal oscillators) but it will remain low only briefly.

IC1a's other input (pin 2) is connected to ground via a 0.1μF capacitor and to a 6.8MΩ feedback resistor. When IC1a is gated off, these components have no effect on the circuit, but as soon as pin 3 goes low it begins to discharge the 0.1μF capacitor via the feedback resistor. After about 0.5s, the falling charge on the capacitor will take pin 2 below the lower threshold and the gate will toggle. (Remember only one input need be low to disable the gate.)

This means that the output goes high once again and therefore begins to charge the 0.1μF capacitor. Hence the cycle continues and IC1a oscillates at about 2Hz while ever it is "enabled".

The actual audio tones are generated by IC1c and IC1d. These gates function as oscillators in exactly the same way as IC1a except that their frequency of operation is higher (nominally, 1.5kHz and 2kHz).

Notice that IC1c and IC1d have a common input line (pins 8 and 12 respectively). This is the control line and functions in exactly the same way as pin 1 of IC1a. When the control line is low, the gates are disabled. The problem with this arrangement is that the output of IC1a goes low when it is triggered and is high at other times.

This has the opposite sense to our requirements, so we employ IC1b as an inverter. By connecting both inputs (pins 5 and 6) together, the output (pin 4) will always be in the opposite state to the inputs and, in this circuit, have the correct sense to control the audio oscillators.

As far as the resistor and capacitor values are concerned for IC1c and IC1d, it may be preferable to compare the results of several different combinations. In any case, 47kΩ and 56kΩ for the resistors and .01μF for the capacitors is a good starting point. Alternative pads are provided on the printed circuit board to fit larger capacitors if necessary.

Construction

Although the project can be built into a plastic utility box measuring 28mm × 54mm × 83mm, a sealable plastic bag is just as functional and will make construction that much simpler.

The printed circuit board (PCB) measures only 75mm × 32mm and is coded 83a16. If you do not intend to mount it in a box, the transducer can be fixed directly to the PCB. Space has been provided for this purpose although the transducer can also be screwed to the lid of the box (where applicable).

The 4.7μF electrolytic capacitor and the diode are both polarised and therefore need to be mounted exactly as shown on the overlay diagram. The LDR is not polarised but must be mounted proud of the PCB to clear the other components. If you do intend to put the project in a box, the LDR should be mounted on the lid with two wires connecting it to the mounting holes.

The 0.1μF capacitor is specified in the parts list as a monolithic type. This is necessary only if the project is fitted into the plastic "zippy" box where a normal 0.1μF greencap would be too large.

Put the 4093 in place only after all the other components have been installed and don't overdo the heat when soldering. Note that the IC is a CMOS device. Make sure that it is mounted the right way round and solder the supply pins (7 and 14) first.

The project is actually quite a tight fit in the "zippy" box so you'll need to take care with the installation. Use the accompanying photograph as a guide. The most likely cause of trouble is the battery – it will foul the transducer and LDR if they are not installed carefully.

We suggest that you wrap the battery in foam so that it does not short with components on the PCB.

As already intimated, we have not included a switch in the circuit – once the battery is connected the project will be operational. For testing, it is not necessary to actually put the alarm in the refrigerator. Covering the LDR with an opaque card will suffice for the "dark" condition and room light will trigger it when the card is removed.

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See Review June EA, p.137.

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Low-cost parallel to serial converter

There are a number of times when a simple, cheap RS232C serial interface is required, for testing terminals and modems for example. Often, too, there is a problem in trying to use equipment that has a serial interface with a computer which has only a Centronics-type parallel output port. This project is the answer.

by ROBERT GAREB*

This simple and inexpensive RS232C interface uses only five ICs and can be used as a useful piece of test gear (stand alone) or as a parallel-to-serial converter for any computer which uses the Centronics standard parallel port, such as the TRS-80 (Model I, II or III), System-80 or Apple II. In this application the only addition to the stand-alone configuration is the interconnecting cable!

When used with a computer the serial interface is driven by exactly the same software as used with a Centronics-type parallel port. In most cases this will be the LPRINT and LLIST statements of Basic.

The interface supports RS232C (the most common type of serial interface), 20mA loop and TTL output. It is basically a simplification of the bidirectional interface project described in "Electronics Australia" in April 1981 and, as a one-way serial interface, can still support hardware "handshaking" if required. Handshaking is achieved by taking control of pin 23 of the standard Centronics interface, normally used as a signal back to the computer to indicate that the printer is out of paper. If not used for handshaking this pin must be tied to ground as shown in the circuit diagram.

*PO Box 122, Bondi Beach, NSW, 2026

As can be seen by the accompanying photographs, the unit has been built up on Veroboard. I have not made a PCB as it does not take long to wire the circuit using Veroboard. The most suitable type is the one which is already divided into sections.

Photographs 1 and 2 shows the circuit board configured as a stand alone RS232 terminal, with the DIP switches nearest the 5303 UART (the 40 pin IC) set to transmit the letter "J" (ASCII code is 4A, or 01001010 in binary). The other switches in the photo are set for 4800 baud (although speeds from 75 to 9600 have been catered for) and an 8-bit word with no parity.

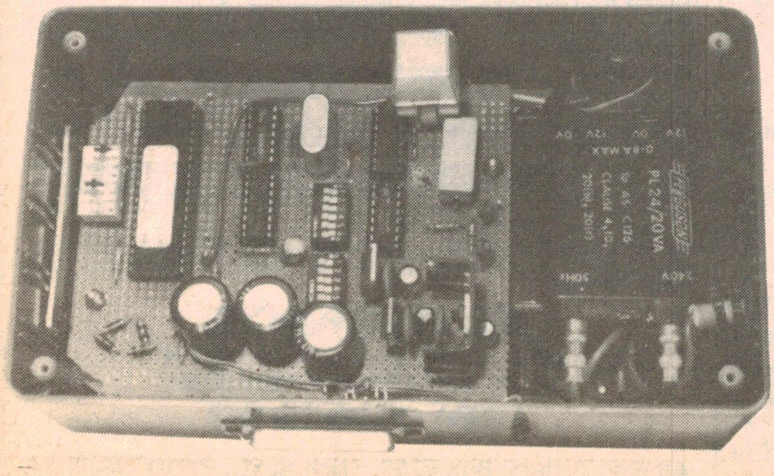
How it works

The main IC is a 5303, which is the Universal Asynchronous Receiver Transmitter or UART. This takes the parallel data (D0-D7) and converts it to serial data. Pin 21 is the reset signal, and the 10kΩ/22μF RC combination provides a reset pulse on power up. The 2.304MHz crystal used is readily available and was used in the Playmaster AM/FM Tuner, November 1979. This crystal together with the 4069 (a hex inverter) forms the oscillator circuit. The capacitor marked Cx on the diagram should be left out initially.

In the majority of cases the circuit will start to oscillate immediately on power-up but in some rare cases, especially with old crystals, a capacitor in the range 0-15pF may be required to start the oscillator.

The oscillator output is divided by 15 by the 4526 (a programmable divide-by-n counter) giving 153.6kHz, which is the required clock frequency for a baud rate of 9600. The clock frequency is the baud rate times 16. This clock is then fed to the 4040 (a 12-bit binary counter) and one of eight outputs is used as the master clock for the UART via a buffer for the lower baud rate clock frequencies.

Pins 35-39 of the UART are used to pro-



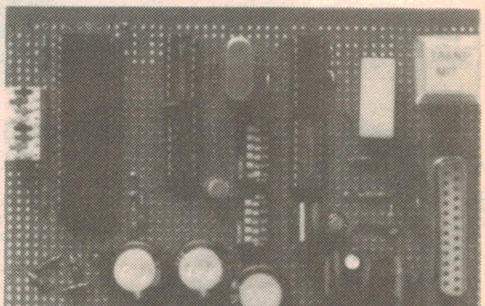
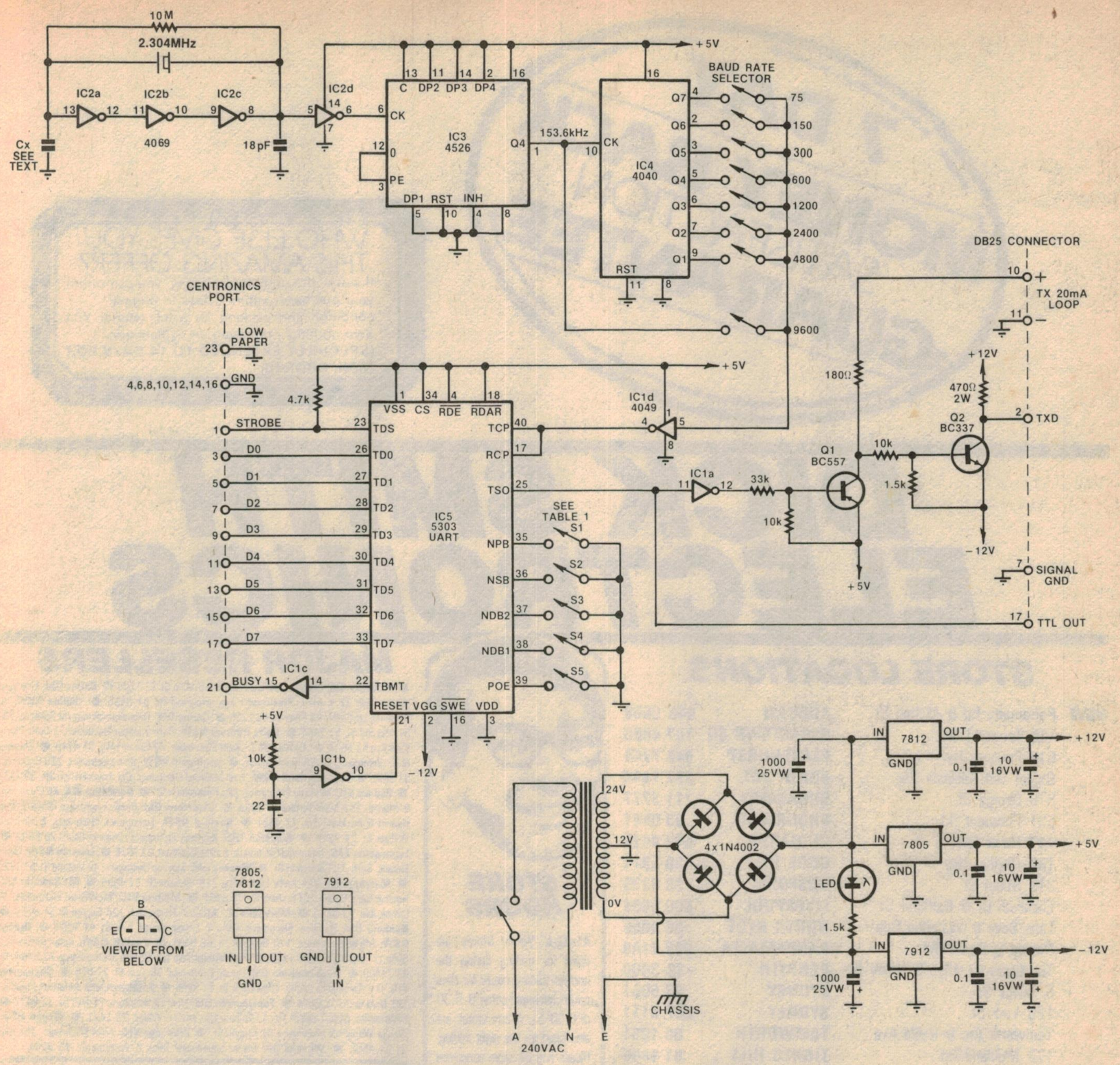
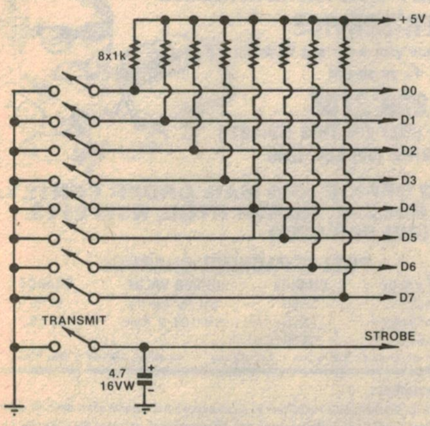


Photo 1 (left) is the "stand alone" version of the RS-232C interface assembled in a plastic utility box. Photo 2 (above) shows another version with a 25 pin D-type connector.



This circuit diagram shows the parallel to serial interface as it would be connected to a computer.



In the stand-alone mode DIP switches are used to set up the data to be transmitted. The pushbutton simulates the data available strobe from a Centronics port.

Table 1: the data transmission format

Switch	On	Off	Function
1	Parity	No Parity	
2	1 Stop Bit	2 Stop Bits	(1.5 stop bits for 5-bit words)
5	Odd Parity	Even Parity	(provided S1 – "ON" to enable parity)
S3	S4	Word Length	
On	On	5 Bits	
On	Off	6 Bits	
Off	On	7 Bits	(S3 and S4 are used in conjunction to set the word length.)
Off	Off	8 Bits	

This table shows the functions of DIP switches S1 to S5. They set the length of the word transmitted and enable odd or even parity checking. The bi-directional serial interace article (EA, April 1981) contains a more complete description of these functions.

gram whether the character transmitted will have odd, even or no parity, the number of bits in the word and the number of stop bits. Depending on the application, these as well as the baud rate selector may be either wire links or DIP switches. If the unit is going to be used solely as a printer interface then one would probably not need to change the setting and therefore would not need DIP switches.

Pin 25 of the UART, TSO, or Transmit Serial Output is the output. This is a TTL output and is taken to a transistor level converter, via IC1a. The 20mA loop output is derived from transistor Q1. The output for RS232C standard must be between −3 and −12 volts for a logical "1" and between +3 and +12 volts for a logical "0". As can be seen from the circuit diagram, the output will swing from −12V to +12V depending on whether the final transistor, Q2, is on or off, to provide these levels.

Pin 23 of the UART is the strobe signal, called TDS. This is the signal sent by the computer to tell the UART that the data is ready to send. The data (D0-D7) is then latched into the UART and sent out serially. If the circuit is being used as a printer interface then this pin is connected to pin 1 of the Centronics Parallel Interface, which is Strobe (active low).

If the interface is being used as a stand alone RS232C terminal, then Strobe is connected to a SPST switch, which when pressed will send out the character set up by the configuration of the DIP switches on the UART data inputs.

Pin 22 of the UART, TBMT, or Transmitter Buffer Empty, lets the computer know that it can send another character to be transmitted. This is connected to the Centronics signal, via an inverter, as the Busy requires a low when not busy, and the 5303 outputs a high signal in this condition. Pin 21 on the Centronics Interface is the Busy signal. If the interface is being used as a terminal only, then this is not used.

Pin 16 of the 5303, SWE, or Status Word Enable, tells the UART to constantly output the status word. This tells the outside world the current status of the UART. Pin 16 is grounded in this application.

The method of sending a character is as follows: the computer checks the busy line and determines that the interface is not busy. It then sets up the data on D0-D7 and gives a strobe pulse, which starts the UART sending out the data. While the data is being sent, the Busy line tells the computer to wait and when the character has been sent the UART releases the "busy" state, and is ready to receive the next character.

PARTS LIST

1 Ferguson PL24/20VA or equivalent transformer
1 mains cable and plug
1 mains cord clamp
1 terminal block
1 piece of Veroboard, 13cm x 10cm

SEMICONDUCTORS
1 5303 UART
1 4526 programmable divide-by-n counter
1 4040 12-stage binary counter
1 4049 hex inverting buffer
1 4069 hex inverter
1 BC557 PNP transistor
1 BC337 NPN transistor
4 IN4002 diodes
1 LED
1 7805 +5V voltage regulator
1 7812 +12V voltage regulator
1 7912 −12V voltage regulator
1 2.304MHz crystal

RESISTORS
(5% ¼W, unless specified)
1 x 10MΩ, 1 x 33kΩ, 3 x 10kΩ, 1 x 4.7kΩ, 1 x 1.5kΩ, 1 x 470Ω 2W, 1 x 180Ω

CAPACITORS
2 1000µF/25VW electrolytic
1 22µF/16VW electrolytic
3 10µF/10VW electrolytic
1 4.7µF/16VW electrolytic (required for stand alone version only)
3 0.1µF ceramic
1 18pF ceramic
1 15pF ceramic (see text)

MISCELLANEOUS
3 8-way DIP switches (only 2 required for use with a computer)
1 SPSP pushbutton switch (required for stand alone version only)
1 plastic utility box 19 x 11 x 5.6cm
1 DB25 plug or socket, depending on requirements
*1 34-way board edge connector to suit Centronics port of computer**
*1 metre of 34-way ribbon cable**
*(*Not required for stand alone version)*

Two other status bits, RDA (Received Data Available), and RDAR (Receiver Data Available Reset Input) are not used in this interface.

The DIP switches adjacent to the 4040 select the baud rate (only one is on at any time!), while the DIP switches adjacent the 5303, labelled S1-S5, select the format of the serial data according to Table 1.

The power supply uses a 24 or 30V centre-tapped transformer with the output rectified and fed to three voltage regulators for +5, +12 and −12V. Photograph 1 shows the assembled unit in a plastic utility case, using a Ferguson PL24/20VA transformer.

The adaptability of this interface to a large number of applications, and the fact that no special driver software is required are two of the main features of this circuit. A stand alone RS232C interface and the parallel to serial converter are only two of the applications.

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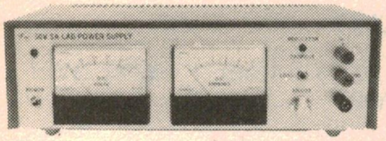

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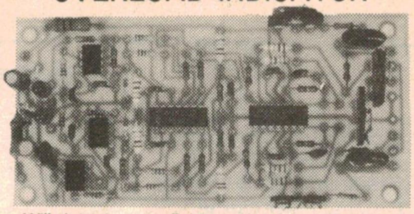

Will detect even slight overload conditions and is not affected by load impedance or varying supply voltages. **E.A. JUNE '83**

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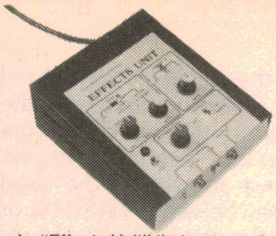

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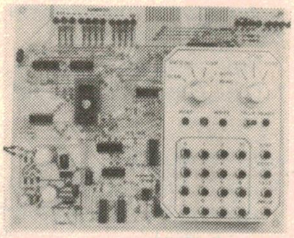

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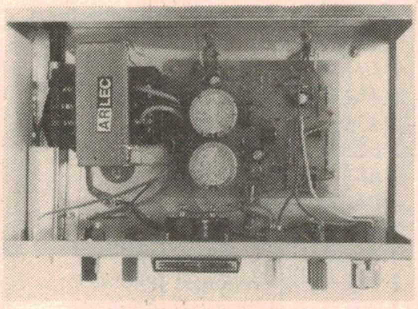

Built around positive and negative 3-Terminal Regulators, this versatile dual tracking Power Supply can provide voltages from ±1.3V to ±22V at currents up to 2A. In addition, the Supply features a fixed +5V 0.9A output and is completely protected against short circuits, overloads and thermal runaway. **EA March 82**

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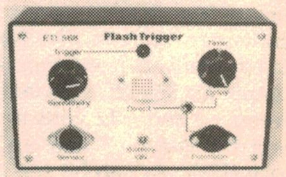

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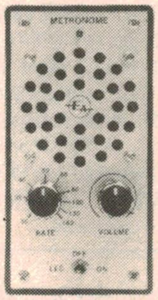

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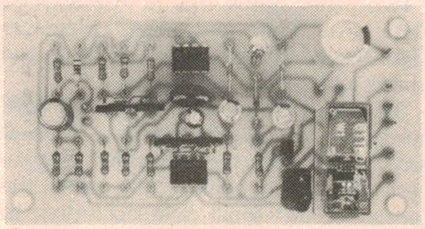

EA's great new Voice Operated Relay can be used to control a tape recorder, as a VOX circuit for a transmitter, or to control a slide projector. **EA April 82**

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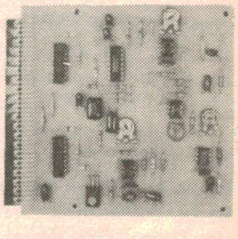

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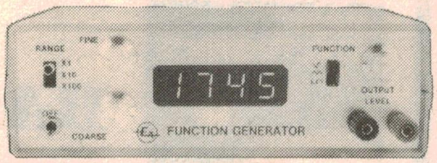

This Function Generator with digital readout produces Sine, Triangle and Square waves over a frequency range from below 20Hz to above 160kHz with low distortion and good envelope stability. It has an inbuilt four-digit frequency counter for ease and accuracy of frequency setting. **EA April 82**

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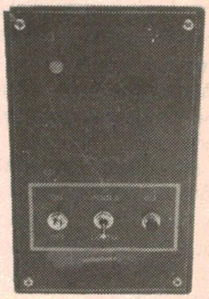

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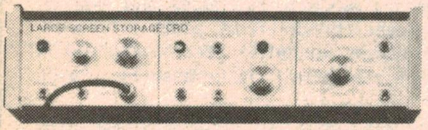

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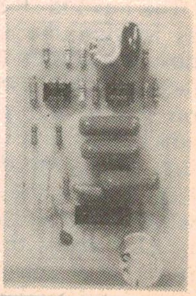

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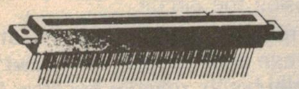

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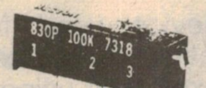
- RI 820 8V @ 20A 15V @ 1A 15V @ 3A $44.50

20 TURN CERMET TRIM POT



SPECTROL 43P ACTUAL SIZE

STOCK RESISTANCE VALUES
10R, 20R, 50R, 100R, 200R, 500R, 1K, 2K, 5K, 10K, 20K, 50K, 100K, 200K, 500K, 1M, 2M

1—9	$2.20
10—99	$1.90
100	$1.70

Values may be mixed.

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$42.50

19-key pad includes 1-10 keys ABCDEF and 2 optional keys and a shift key.

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Dials to suit 10 T Pots

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Model 18 1" x 1.75" dia	$27.50

cermet single TURN TRIM POT

Spectrol model 63P
ACTUAL SIZE

STOCK VALUES
10R, 20R, 50R, 100R, 200R, 500R, 1K, 2K, 5K, 10K, 20K, 50K, 200K, 500K, 1M, 2M

1—9	$1.20
10—99	$1.00
100	$0.90

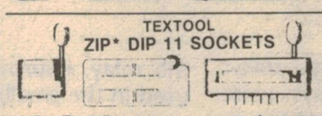
Values may be mixed.

DIP SWITCHES SPST

P/N	No of Switches	Price
SD4	4	1.70
SD5	5	1.90
SD6	6	2.30
SD7	7	2.40
SD8	8	2.50
SD9	9	2.70
SD10	10	3.00

DIP SWITCHES SPST

TEXTOOL
ZIP* DIP 11 SOCKETS



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*Zero Insertion Pressure

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2.4576MHz	5.00
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4.44MHz	4.00
4.75MHz	4.00
5MHz	4.00
5.0688MHz	4.00
6MHz	4.00
6.14MHz	4.00
6.6670MHz	4.00
8MHz	4.90
8.867238MHz	4.90
10MHz	4.90
11MHz	4.90
12MHz	4.90
14.31818MHz	4.90
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HS3 — 150mm	5.80	5.40	4.90	3.80	2.90	2.70
HS4 — 225mm	8.10	7.60	7.10	5.90	4.50	4.30
HS5 — 300mm	8.90	8.40	7.90	6.50	4.90	4.60
Unanodised						
HS11 — 38mm	1.40	1.20	1.00	0.90	0.80	0.70
HS12 — 75mm	2.50	2.20	1.90	1.60	1.25	1.20
HS13 — 150mm	4.90	4.50	4.00	3.20	2.45	2.40

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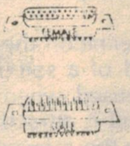

PART NO	DESCRIPTION	1-9	10-25	25+
DE-9P	9 PIN MALE	$3.50	$3.50	$3.10
DE-9S	9 PIN F/MALE	4.50	4.20	3.90
DE-9C	9 PIN COVER	2.20	2.10	1.90
DA-15P	15 PIN MALE	4.50	4.20	3.90
DA-15S	15 PIN F/MALE	5.10	4.90	4.70
DA-15C	15 PIN COVER	2.30	2.10	2.00
DB-25P	25 PIN MALE	4.50	4.40	3.90
DB-25S	25 PIN F/MALE	4.95	4.60	4.10
DB-25C	1 pc Grey Hood	2.40	2.20	2.00
DB-25C2B	2 pc Black Hood	2.80	2.70	2.50
DB-25C2G	2 pc Grey Hood	2.70	2.50	2.40
DC-37P	37 PIN MALE	7.90	7.50	7.10
DC-37S	37 PIN F/MALE	10.90	9.90	9.10
DC-37C	37 PIN COVER	4.90	4.50	4.10
DH/S	Hardware set (2 Pairs)	2.10	1.90	1.80

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Learn the basic principals

Basic Electronics

Design & build your own relay

The relay is a simple electromechanical device used for switching. While commercial relays use complicated tooling and are made in tens of thousands, you can make your own using a few simple tools. Such a homemade relay can be used to switch low voltage lights or other devices.

by JEFF SKEEN

Of all electronic components, relays are perhaps the oldest. Relays were around long before valves were invented as they were originally used in telegraph networks. In fact, the term relay derives directly from its telegraph origins, in that it was used for "relaying" signals.

Another way of looking at a relay is as a power amplifier, because it is just as much an amplifier as is a valve or a transistor. Granted, it is a mechanical amplifier – and a digital one – but an amplifier none the less, because the amount of power needed to operate it need be only a tiny fraction of the power it can control.

And relays were the first "logic" elements, as used in telephone networks long before the concepts or logic and digital circuitry were evolved. And in spite of the rising use of semiconductor devices, relays continue to be used in untold millions around the world. It is true to say that the relay will be around for a long time yet.

Although modern relays are usually much smaller than their earlier counterparts and are enclosed in fancy plastic dust covers, there is little difference in their principles of operation.

This does not mean that relay design has stood still. Far from it. But the major development has been in greatly reducing the power required and the size of relays. Relays can now be supplied in the same size package as 14-pin dual in-line integrated circuits. This process of miniaturisation has not been achieved easily as reductions in relay size may mean a compromise in performance.

For example, higher flux densities in the magnetic path of the smaller relay can mean less efficient operation and the voltage and current ratings of the contacts will be reduced due to the smaller dimensions. To maintain the ratings of the relay, improved materials must be used in the smaller design.

Principle of operation

The principle of operation of a relay is, at first sight, deceptively simple. But, when a close analysis of relay performance is performed, they are not simple devices at all. However, for the user with just a passing interest in these devices, they can be regarded as follows. The relay is really just an electromagnet which operates a lever and one or more sets of contacts.

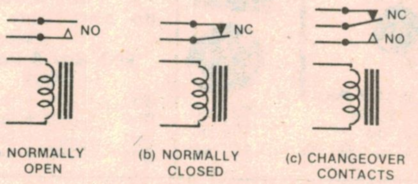


Fig. 1

The three basic relay configurations and their schematic symbols. Many relays have multiple contact sets.

By definition then, the relay has a coil wound of a soft-iron core. The core is magnetised when current flows in the coil and it attracts the lever (armature), driving the moving contacts. This closes or opens one or more external circuits. When current ceases to flow in the relay coil, the core ceases to attract the lever, which is usually spring-loaded, and the electrical circuit (or circuits) is broken.

A relay may have one or more sets of contacts. In the simplest relay, such as the horn relay in a car, the contacts are "normally open" and close only when the relay is energised. Alternatively, a relay may have a set of contacts which are "normally closed" and these open when the relay is energised.

Normally open and normally closed contacts can be paired to produce "changeover" contacts which perform the same function as a single-pole, double-throw switch. In fact, most general purpose relays have two sets of changeover contacts but the variations are endless. Fig. 1 shows the usual way of representing a relay on a circuit, together with a number of contact variations.

One new development in relays in the last 30 years has been the reed relay. This normally consists of a single set of normally open contacts enclosed within a glass tube (with an inert gas inside). The glass tube is surrounded by a coil of wire which is usually wound on a plastic bobbin. The contacts themselves are made of soft-iron, while the contact surfaces are plated with a precious metal.

When current is passed through the coil, the two contacts are magnetised and they are attracted to each other, thus closing the circuit.

Reed relays generally have relatively low voltage and current ratings but they are usually highly reliable because there is no contact deterioration (when used within ratings).

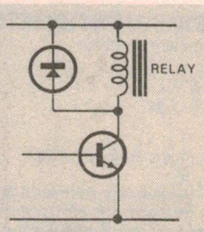


Fig. 2

A diode across the relay protects the driving transistor from back EMF.

One aspect of relays which we should mention is that of "back-EMF". Since the relay uses a coil which often has a considerable inductance it is liable to generate a "back EMF" when current

through it is interrupted. As with any inductor, the value of the back-EMF or voltage generated is given by the formula:

$E = L.di/dt$

where L is measured in Henries, di/dt in amperes/second and E is in volts.

The voltage generated by a relay when it is de-energised represents a hazard to any device which is actually driving the relay, such as a transistor. In Fig. 2 for example, a relay is driven by a transistor. When the transistor turns off, the relay back-EMF will attempt to maintain the relay current. This means that the collector voltage will suddenly rise to a very high value which could punch through the transistor.

This is prevented from happening by the diode across the relay coil. The diode is normally reverse-biased by the relay energising voltage but conducts to "clamp" any peak voltages to 0.6V above the positive supply rail. Hence, the transistor is protected from breakdown.

Making your own

Our "build-it-yourself" relay is similar in construction to many conventional relays. The main difference is that we have combined the armature and contact spring into one unit, so that the moving contact is not insulated from the armature. This refinement could be easily added if desired.

Most of the parts used in constructing the relay should be available in home workshops. Possible exceptions to this are the wire, solder lugs and spring.

The spring we used in the relay came from a packet of assorted springs sold by Dick Smith Electronics. The wire used in the coil is 0.125mm enamelled winding wire which is commonly available in 25g spools. One spool is required.

Both this wire and the solder lugs are also available from Dick Smith Electronics. If suitable bolts are not available from the workshop, packets of 3/16-inch by 1½-inch mushroom head roof bolts may be purchased from most hardware stores. (Purists may dislike the use of Imperial terms here, but most stores still sell screws and nuts in these units).

Power for the relay can be any DC voltage between 12 and 30V. The coil will have a resistance in the region of 300Ω so the current drain will not be large.

The relay is constructed from light gauge galvanised iron sheet and is mounted on a particle board base. The dimensions of the particle board base

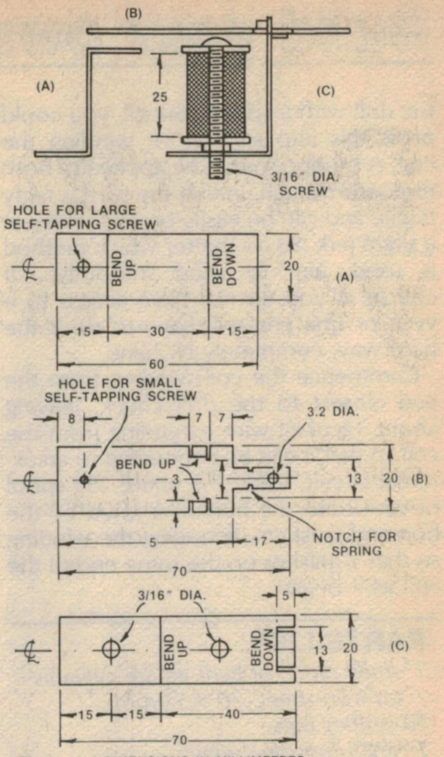


Fig. 4 DIMENSIONS IN MILLIMETRES

This drawing shows the general configuration and suggested dimension of the metalwork used in our relay.

are not critical. We used a piece of board with overall measurements of 165 × 45 × 12mm (length × width × thickness).

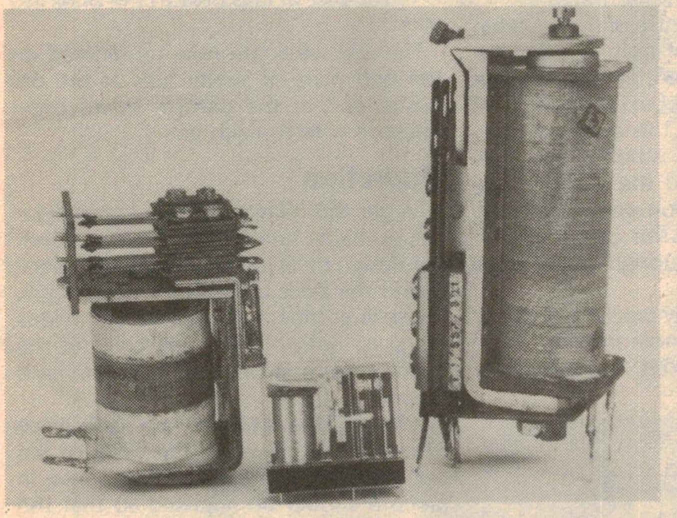
Since the sizes of the metal pieces used in the relay are dependent upon the size of the coil, it is best to start construction with the coil. The coil former is a 3/16 inch (5mm) mushroom head roof bolt 2 inches long on which two 20mm (outside diameter) fibre tap washers are placed. A nut is threaded onto the bolt and used as an end-stop for one of the washers.

The nut should be placed so that with one washer held against the head of the bolt and the other washer held against the nut, there is a gap of 25mm between the washers. A layer of electrician's tape is now wound over the threads of the bolt, between the washers, to protect the coil wire from sharp edges on the threads.

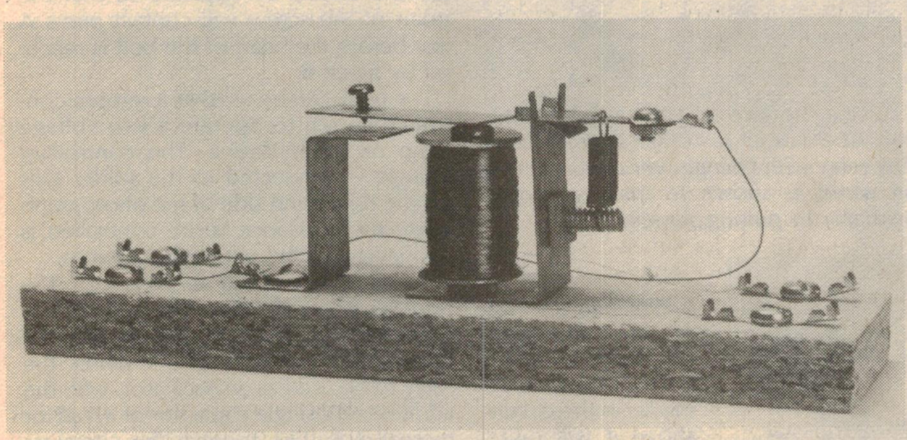
The tape also serves to hold the washers in position and prevent them sliding along the bolt when first winding the coil.

To make winding the coil easier, place the exposed, threaded end of the bolt in the chuck of a hand drill then clamp the drill securely in the vyce. One hand can now be used to turn the drill while the other hand guides the wire onto the bolt. Additionally, the gear ratio of the drill serves to multiply the speed of rotation of the bolt, making the process of winding the coil much quicker.

As an alternative, if you have an elec-



Three typical commercial relays. The two larger ones are now virtually obsolete, being replaced by much smaller ones similar to the one shown.



The finished "build-it-yourself" relay. Note that the two short vertical tabs at the top of support piece (C) function as a stop to limit the armature movement when the coil is de-energised.

tric drill with a speed control, you could press this into service for winding the coil. A caution should be applied to both methods though, in that the wire is fairly fragile and can be easily broken with just a slight jerk. So no matter which method is used, aim to wind smoothly. Of course, if you do not have access to a vyce or drill you will have to do it the hard way, completely by hand.

Commence the coil winding from the end closest to the drill chuck, leaving about 12cm of wire extending from the coil so that it can be connected to an external circuit. Wind the entire 25g spool of wire onto the bobbin formed by the bolt and washers, arranging the winding so that it finishes on the same end of the coil as it began.

PARTS LIST

- 1 *small piece of light gauge galvanised iron sheet, 70 × 60mm*
- 10 *solder lugs*
- 1 *small tension spring*
- 5 *large self tapping screws*
- 1 *small self tapping screw*
- 1 *⅛ inch nut and bolt*
- 2 *1½ × 3/16th inch mushroom head roof bolts and nuts*
- 1 *piece of particle board, 165 × 45 × 12mm*
- 1 *25g spool .125mm enamelled winding wire*
- 2 *fibre tap washers 20mm outside diameter*

Again leave about 12cm of wire free at the end of the coil, then, to prevent the wire unravelling, either twist the wires together at the spot where they leave the coil, or wrap insulation tape around the coil. This completes the coil construction.

As we mentioned earlier, the sizes of the metal pieces of the relay depend upon the size of the coil to some extent. We will proceed on the assumption that readers have built a coil with the same dimensions as ours. Where readers have built a larger or smaller coil our measurements should be scaled up or down accordingly.

The three metal pieces used in the relay are cut from a small rectangle of galvanised iron sheet measuring 70 × 60mm. This sheet is cut into three 70 × 20mm strips with a pair of tinsnips. One strip is now trimmed to 60mm in length and forms piece A in our diagrams. The strip should be bent so that its shape and dimensions match those given in Fig. 4 for piece A.

The second strip of galvanised iron should now be cut and bent so that it matches the dimensions given for piece B. The width of the small section on the right hand side of this piece is not given since it depends upon the diameter of the (hooked) end portion of the spring used. The end section should be just wider than the spring so that the spring hook has to be forced onto it.

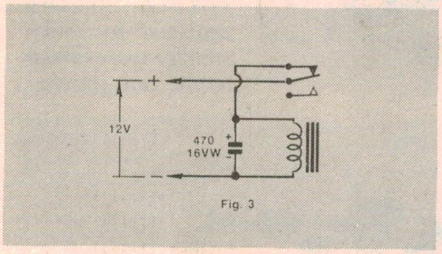
The third piece of metal should be cut and bent now so that it resembles piece C in Fig. 4.

Holes are now drilled in the metal pieces at the places indicated in Fig. 4 One hole cannot be drilled just yet since its exact location depends upon the length of the spring used. This is the hole in the upright section of piece C.

A notch is now cut into each side of the end section of part B at the indicated place and the spring slid along the end section until it rests in the notch.

Drill a hole in the centre of the wooden base so that the roof bolt forming the bobbin can be screwed directly into the wood. Hold the bobbin and piece C together, then screw the assembly into the base until piece C is held tightly between the bobbin and the wood. Now place piece B in position on piece C and mark the location of the centre of the spring hook on the upright section of piece C.

Disassemble the relay pieces and drill a 3/16th-inch diameter hole in piece C at the location just marked. A 3/16th-inch diameter roof bolt trimmed to 15mm in length is placed through the hole and secured tightly to piece C with a nut.



Any relay with changeover contacts can be wired as shown to make a simple oscillator or pulsing device.

Screw a small self tapping screw half way through the hole in the thick end of piece B, and attach a solder lug to the other end of piece B with a ⅛th inch diameter nut and bolt placed through the hole.

Reassemble the bobbin and pieces B and C. The loose end of the spring hanging from piece B can now be slid over the threaded end of the roof bolt. The spring should apply enough tension to hold piece B firmly against the small vertical tabs on piece C. Place piece A in position under the self tapping screw in piece B then secure piece A to the particle board base with a self tapping screw. A solder lug should be placed under the screw to act as an electrical connection.

To finish off the construction, attach eight solder lugs to the particle board base with four small self tapping screws. A wire should be run from the solder lug on piece B to one of the four pairs of solder lugs described above. In the same manner, run a wire from the lug on piece A to the pair of lugs next to the ones just used.

The coil wires are now terminated on the two pairs of solder lugs at the opposite end of the particle board base, one coil wire to each pair.

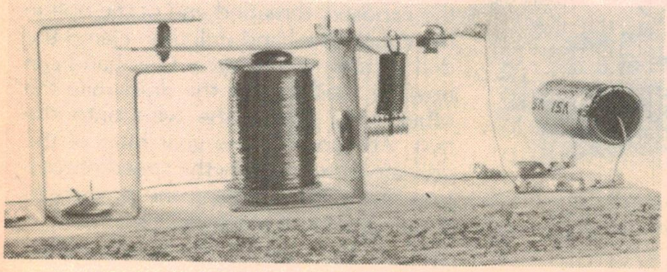
Operation

To get the relay operating correctly, it will probably be necessary to "fine tune" the design by adjusting the tabs on piece C and the bent up sections on piece B. These limit the travel of piece B, the idea being to hold piece B just clear of the head of the bolt on which the bobbin is wound.

When 12V is applied to the coil, piece B should pull down to the head of the bobbin bolt. The self tapping screw in piece B should be adjusted so that the point of the screw will contact piece A just before the head of the bolt is reached by piece B.

The relay can be used as a remote controlled switch to operate a low voltage lamp or other device. The controlling voltage is connected to the solder lugs on the right hand side of the photograph while the appliance to be controlled is connected to the left hand side lugs.

As a final variation, one of the photographs of the relay shows it modified so that it has a set of changeover contacts. This enables the relay to be used as an oscillator, with the addition of a single capacitor of 470μF or thereabouts. Just connect the circuit as shown in Fig. 3 and connect to a supply of 12V or more. The relay should now open and shut at several times a second.



A modified version of the relay with changeover contacts. Connected as shown in the circuit above it will function as a slow oscillator.

See page 98 for full address details

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For use with type 2516 EPROMs

Modified listing for the EPROM programmer

The EPROM programmer for the TRS-80, published in "Electronics Australia" in July, 1980, remains one of the most economical and effective programmers on the market. The program presented here allows it to be used with the popular 2516 2K x 8 EPROM.

This EPROM programmer can be used with 2708, 2516 and 2732 types.

While the TRS-80 EPROM programmer was designed to be used with 2708, 2516 and 2732 EPROMs, the control program presented in the original article was for 2708 devices only. Now that the price of 2516 EPROMs has come down the 2708 has almost gone by the board. In addition to providing 2K of program memory, the 2516 requires only a single 5V supply, rather than the 5V and 12V supplies of the 2708.

The 2516 is also simpler to program, requiring one pass through the memory locations instead of the multiple cycling of the 2708.

With these points in mind we have prepared a new program for the TRS-80 which allows 2516 devices to be programmed. In addition to a new machine language programming routine, three other sections of the program have been replaced with machine language to speed up the programming process. Needless to say, the selector switch of the EPROM programmer must be set in the 2716 position to use this program.

The program is based on a number of subroutines which can be used separately if desired. Simply typing RUN will lead the user through the programming sequence, first verifying that the EPROM is fully erased then prompting the user to enter the data to be programmed. At the conclusion of data entry, the data is displayed and the user is prompted to change any locations which may be in error. Following this editing routine the data is programmed into the EPROM, then read back and compared with the data held in memory.

Data in locations in the EPROM which do not match the contents of the buffer is displayed with an asterisk to indicate that a programming error has occurred.

The various subroutines can also be used separately and in fact the subroutine starting at line 6000 is not used by the main program. It calls a machine language program which reads the contents of an EPROM into the RAM data buffer and can be used in conjunction with the programming subroutine to copy one EPROM into another.

Whenever the routines are used separately the subroutine starting at line 10000 must be run first. This routine reads the machine langauge into memory from data statements and is vital to the operation of the program.

Reprints of the original article covering the construction of the EPROM Programmer can be obtained from our reader information service for $3.00 plus postage. The TRS-80 version of the programmer was described in the July, 1980 issue, with modifications to suit the Exidy Sorcerer computer in August, 1980.

```
10 REM **
20 REM **          ELECTRONICS AUSTRALIA 2708 EPROM PROGRAMMER
30 REM **          WRITTEN BY RON DE JONG 22/5/80
32 REM **          MODIFIED FOR 2516 BY PETER VERNON 12/1/83
40 REM **          FOR TRS-80 LEVEL II BASIC
50 REM **
60 REM **          THE PROGRAM CONSISTS OF A NUMBER  OF
70 REM **          INDIVIDUAL STEPS WHICH CAN BE CALLED  UP
80 REM **          SEPERATELY IF REQUIRED. THE INDIVIDUAL
90 REM **          PROGRAMS ARE LISTED BELOW-
100 REM **         1. RUN 2000 CHECKS TO SEE THAT THE EPROM
110 REM **            HAS BEEN PROPERLY ERASED.
120 REM **         2. RUN 3000 READS DATA INTO MEMORY STARTING
130 REM **            AT LOCATION 30001 FOR SUBSEQUENT LOADING
140 REM **            INTO THE EPROM.
150 REM **         3. RUN 8000 PROVIDES A HEX LISTING
```

listing continued ►

```
160 REM **       FOR PREVIOUSLY ENTERED DATA
170 REM **    4. RUN 4000 PROGRAMS DATA IN MEMORY INTO
180 REM **       THE EPROM USING A MACHINE LANGUAGE DRIVER.
190 REM **    5. RUN 6000 IS A ROUTINE FOR LOADING DATA
200 REM **       FROM AN EPROM INTO MEMORY FOR SUBSEQUENT
210 REM **       PROGRAMMING INTO A BLANK ROM. HENCE IF A
220 REM **       BLANK ROM IS LATER INSERTED AND RUN 4000
230 REM **       EXECUTED THE FIRST EPROM WILL BE DUPLICATED
240 REM **    6. RUN 9000 IS AN EDITING ROUTINE WHICH
250 REM **       ACCEPTS A HEX ADDRESS FOLLOWED BY
260 REM **       NEW DATA TO BE PLACED AT THAT LOCATION.
270 REM **    7. RUN 10000 READS THE DATA FOR MACHINE LANGUAGE
280 REM **       INTO MEMORY.
290 REM **
990 DEFINT A-Z
1000 GOSUB 10000:REM READ IN MACHINE LANGUAGE DATA
1010 GOSUB 2000:REM VERIFY ERASURE AND FILL BUFFER WITH 0FFH
1020 GOSUB 3000:REM READ DATA INTO MEMORY BUFFER FROM KEYBOARD
1030 GOSUB 8000:REM LIST BUFFER CONTENTS IN HEX
1035 GOSUB 9000:REM ROUTINE ALLOWS EDITING OF BUFFER CONTENTS
1040 GOSUB 4000:REM PROGRAM BUFFER CONTENTS INTO EPROM
1050 Z=0:GOSUB 5000:REM
1060 END
2000 PRINT "VERIFYING EPROM ERASURE"
2004 INPUT "SWITCH TO READ MODE";A$
2010 POKE 16526,66:POKE 16527,127
2020 J=USR(0):REM VERIFY THAT EPROM IS ERASED
2030 IF PEEK(32608)<>0 THEN PRINT "EPROM NOT ERASED":END
2040 POKE 16526,52:POKE 16527,127
2050 J=USR(1):REM FILL 2K BUFFER WITH 0FFH
2060 PRINT "EPROM ERASED AND BUFFER FILLED WITH 0FFH"
2070 RETURN
3000 PRINT:PRINT"NOW ENTER DATA TO BE STORED IN EPROM"
3004 FOR I=1 TO 2048
3010 J=I-1:GOSUB 7050
3020 PRINT "0"+P$;
3030 A$="":INPUT A$
3040 IF LEN(A$)=0 THEN GOTO 3090
3050 GOSUB 7000
3060 K=J:GOSUB 7000
3070 POKE 30000+I,16*K+J
3080 NEXT I
3090 PRINT "DATA ENTRY COMPLETED"
3100 RETURN
4000 INPUT "SWITCH TO PROGRAM MODE";A$
4010 POKE 16526,0:POKE 16527,127
4012 PRINT "PROGRAMMING EPROM, PLEASE WAIT......"
4020 J=USR(2):REM PROGRAM BUFFER CONTENTS INTO EPROM
4030 PRINT "EPROM PROGRAMMING COMPLETED"
4040 RETURN
5000 INPUT "SWITCH TO READ MODE";A$
5010 J=INP(129):I=1
5020 FOR Q=1 TO 9
5030 P$=RIGHT$(P$,2)
5040 FOR R=1 TO 15
5050 J=I-1:GOSUB 7050
5060 PRINT "0"+P$+"      ";
5070 FOR T=1 TO 8
5080 IF Z=1 THEN J=PEEK(30000+I):ELSE J=INP(128)
5090 GOSUB 7050
5100 P$=RIGHT$(P$,2)
5110 IF J=PEEK(30000+I) THEN PRINT P$;"    ";:ELSE PRINT P$;"*   ";
5120 J=INP(130):I=I+1
5130 NEXT T
5140 PRINT
5150 IF I>2048 THEN RETURN
5160 NEXT R
5170 INPUT A$
5180 NEXT Q
5190 RETURN
6000 INPUT "SWITCH TO READ MODE";A$
6010 POKE 16526,32:POKE 16527,127
6012 J=USR(3):REM READ EPROM CONTENTS INTO BUFFER
6020 Z=1:GOSUB 5010
6030 RETURN
7000 B$=LEFT$(A$,1):J=LEN(A$)-1
7010 A$=RIGHT$(A$,J)
7020 IF B$<"A" THEN J=ASC(B$)-ASC("0"):RETURN
7030 J=ASC(B$)-ASC("A")+10
7040 RETURN
7050 K=INT(J/256)
7060 M=J-K*256
7070 L=INT(M/16)
7080 M=M-L*16
7090 N=K:GOSUB 7140
7100 P$=N$:N=L:GOSUB 7140
7110 P$=P$+N$:N=M:GOSUB 7140
7120 P$=P$+N$
7130 RETURN
7140 IF N>9 THEN N$=CHR$(N-10+ASC("A")):RETURN
7150 N$=CHR$(N+ASC("0"))
7160 RETURN
8000 PRINT:PRINT"BUFFER CONTENTS ARE AS FOLLOWS;":PRINT
8010 Z=1:GOSUB 5010
8020 RETURN
9000 PRINT:PRINT"IF THERE ARE ANY CHANGES"
9004 PRINT "THE INPUT FORMAT IS AAAA-DD"
9010 INPUT A$
9020 IF LEN(A$)=0 THEN RETURN
9030 GOSUB 7000
9040 K=J:GOSUB 7000
9050 K=16*K+J:GOSUB 7000
9060 K=16*K+J:GOSUB 7000
9070 K=16*K+J:GOSUB 7000
9080 A$=RIGHT$(A$,2):GOSUB 7000
9090 L=J:GOSUB 7000
9100 POKE 30001+K,16*L+J
9110 GOTO 9010
9990 REM DATA FOR MACHINE CODE ROUTINES FOLLOWS
10000 DATA 33,49,117,1,0,8,219,129,126,211,128,211,130,17
10010 DATA 172,13,27,123,178,32,251,211,129,35,219,130,11
10020 DATA 120,177,32,233,201,1,0,8,33,49,117,219,129,219,128
10030 DATA 119,35,219,130,11,120,177,32,245,201,33,49,117,17
10040 DATA 50,117,1,0,8,54,255,237,176,201,62,0,50,96
10050 DATA 127,1,0,8,219,129,219,128,254,255,32,8,219,130,11
10060 DATA 121,176,32,243,201,62,255,50,96,127,201
10070 FOR S=0 TO 95:READ A:POKE 32512+S,A:NEXT S
10080 RETURN
```

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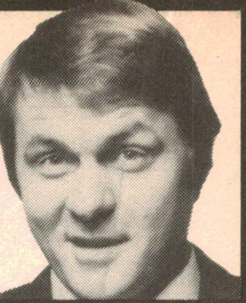
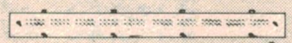
Good Buy July



Dear Customer, It's midwinter again (groan) — every July our sales have been lousy as it seem all the electronic enthusiasts in Australia would rather sit around a nice warm fire than tinker with Electronics. This year, to make it even worse we've expanded our overnight mail order service section by around 400%. So we simply can't afford another slow July — hence you reap the benefit of all the exciting Altronics quality direct import components and products advertised throughout this magazine. Remember our technically qualified staff are waiting right now for your phone or mail order — Regards,

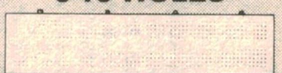
Jack O'Donnell

MINI STRIP 100 HOLES



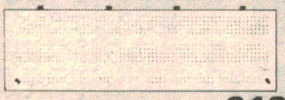
P 1000 .... $1.95

640 HOLES



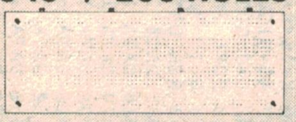
P 1005 .... $8.50

640 + 100 HOLES



P 1007 .... $10.00

640 + 200 HOLES



P 1009 .... $12.00

PROTOTYPE SOLDERLESS BREAD BOARDS

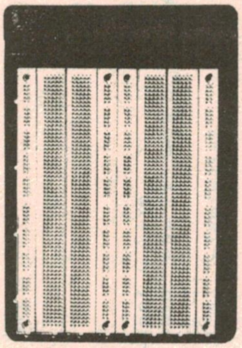
NON-CORROSIVE NICKEL ALLOY CONTACTS RELIABLE FOR 50,000 INSERTIONS

There's a limit to just how many times you can resolder components while prototyping before you either destroy the component or lift a track from the vero.

These solderless breadboards enable circuits to be literally thrown together in an instant, yet all components remain reusable.

A necessity in all research laboratories to save on expensive development costs.

- ☆ Standard 0.1 inch spacings.
- ☆ Accepts all LSI'S, semis, transistors, diodes, leds and passives.
- ☆ 22-30 gauge solid hook up wire for interconnections.
- ☆ Boards are "Keyed" to enable easy expansion.

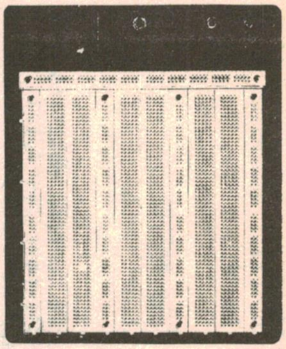


400 + 1280 HOLES

ACCEPTS UP TO 16 x 16 pin D.I.L. IC'S

SCREW TERMINALS FOR PS CONNECTIONS

P 1012 .... $26



500 + 1920 HOLES

ACCEPTS UP TO 24 x 16 pin D.I.L. IC'S

METAL BACKING PLATE FOR SHIELDING OF SENSITIVE CIRCUITRY

P 1015 .... $38

PCB DESIGN TAPES

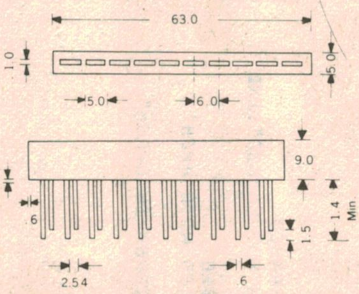
16m LONG REELS
3 HANDY WIDTHS

·5mm
H 8602 .... $2.95
1mm
H 8603 .... $2.95
1·5mm
H 8604 .... $2.95
H 8605 (PACK OF 3) ... $8.50

CREPE TAPES CURVE EASILY

NEW PRODUCT

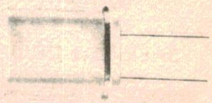
10 SEG. RED BAR GRAPH MODULE



Z 0180 **$2.50** 10 up $2.20 ea.

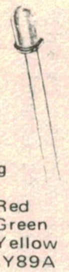
LIMIT OF 20 PER CUSTOMER UNTIL MORE STOCKS ARRIVE

TOP QUALITY XTALS



			ea.	10 +
Y 1000	1.0000 mHz	Parallel	$11.50	$10.25
Y 1003	1.8432 mHz	Parallel	9.50	8.75
Y 1006	2.0000 mHz	Parallel	7.50	6.75
Y 1010	3.5875 mHz	Series	3.00	2.75
Y 1012	4.0000 mHz	Parallel	5.00	4.50
Y 1015	4.1940 mHz	Parallel	5.00	4.50
Y 1017	5.0000 mHz	Parallel	5.00	4.50
Y 1018	6.0000 mHz	Series	5.00	4.50
Y 1019	8.0000 mHz	Series	5.00	4.50
Y 1020	10.0000 mHz	Series	5.00	4.50
Y 1025	12.0000 mHz	Series	5.00	4.50
Y 1030	16.0000 mHz	Series	5.00	4.50

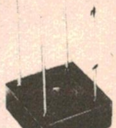
LEDS



Z 0140	Led 3mm Red	.14	.10
Z 0141	Led 3mm Green	.20	.18
Z 0143	Led 3mm Yellow	.22	.20
Z 0150	Led 5mm Red	.14	.10
Z 0151	Led 5mm Green	.20	.18
Z 0152	Led 5mm Yellow	.22	.20
Z 0154	Led 5mm Orange	.25	.22
Z 0159	Led 5mm Flashing FRL4403	.49	.45
Z 0160	Led Rectangular Red	.22	.19
Z 0162	Led Rectangular Green	.25	.22
Z 0164	Led Rectangular Yellow	.25	.22
Z 1072	Led Infra Red CQY89A	.55	.52

6A/400V DIODE BRIDGE

PRICE SLASHED



Z 0134 .... $1.75

MINI TOGGLE SWITCHES

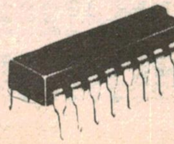
OEM QUALITY 250V 2 AMP RATED

6mm mounting hole
12mm x 12.7mm x 20mm (D)

	ea.	10 +
S 1010 SPDT	$1.25	$1.10
S 1025 SPDT Centre off	$1.50	$1.25
S 1020 DPDT	$1.50	$1.25
S 1030 DPDT Centre off	$1.95	$1.75

LED DRIVERS

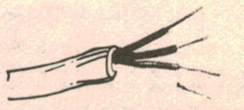
GENUINE NATIONAL SEMI'S



LM 3914
Z 2214 ... $4.50
LM 3915
Z 2215 ... $3.65

TELEPHONE CABLE

STILL AT PRE DEVALUATION PRICE



FOUR WIRE
RED/BLACK/BLUE/WHITE

W 0302 per metre .... .50
per 200m roll $46.00

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Powerful New 6000 RPM Mini Drill for PC Work

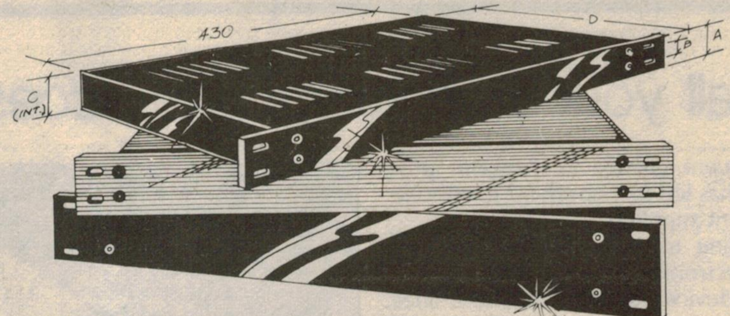
Tons of Torque. Just the shot for PCB work. 12V DC operated from external Power Pack 1.2mm chuck capacity. Supplied c/w 1mm drill bit.

T2302 . . . . **$12.95**

Drill Bits:
T2320 (0.8mm) . . . **$1.25**
T2325 (1.0mm) . . . **$1.25**

YOUR BUDGET PROBABLY ~~WON'T~~ WILL STRETCH TO AFFORD OUR PROFESSIONAL SERIES ALL ALUMINIUM RACK CABINETS

NOW YOUR PREAMPS, AMPS, CONTROL MODULES MONITOR PANELS ETC. CAN LOOK EVERY BIT AS GOOD AS TECHNICS, NAKAMICHI AND OTHER TOP MANUFACTURERS



★ These beautifully crafted rack cabinet boxes will give your equipment a real 1st class appearance. ★ All aluminium construction. ★ REMOVABLE TOP AND BOTTOM PANELS. ★ All dimensioning conforms to the International Standard. ★ Natural or Black finish. ★ Ventilated lid. ★ Deluxe brushed finish anodised front panel. ★ Individually cartoned. ★ Supplied in Flat Pack Form — Easily assembled in minutes.

Side Elevation:
D = 254mm C (Internal Chassis Height)
B (Mounting Bolt Centres)

Cat. No.	Finish	A	B	C	ea.	5 +
H 0401	Natural	44	34	38	$42.50	$39.95
H 0402	Natural	88	57	82	49.95	47.50
H 0403	Natural	132	89	126	55.00	49.95
H 0411	Black	44	34	38	42.50	39.95
H 0412	Black	88	57	82	49.95	47.50
H 0413	Black	132	89	126	55.00	49.95

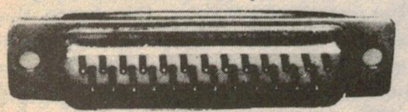
Beware of other rack boxes that do not conform to International Rack Sizing.

All Altronics prices include Sales Tax. Don't be conned by other advertisers whose seemingly low prices are "plus Tax in fine print". You could well pay up to 32½% more.

UK MADE, GOLD PLATED

D RANGE CONNECTORS

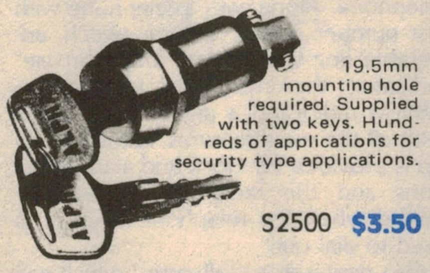
SAVE 25% ON BULK QUANTITIES!



	ea.	10 +	25 +
P 0880 DB9 Male 9 Pin	2.50	2.20	1.95
P 0881 DB9 Female 9 Pin	2.95	2.70	2.50
P 0885 DB9 Backshell	2.85	2.50	2.30
P 0890 DB15 Male 15 Pin	2.95	2.50	2.29
P 0891 DB15 Female 15 Pin	3.50	3.00	2.80
P 0895 DB15 Backshell	2.85	2.50	2.30
P 0900 DB25 Male 25 Pin	4.50	3.95	3.60
P 0901 DB25 Female 25 Pin	4.95	4.50	3.98
P 0905 DB25 Backshell	2.85	2.50	2.30

KEY OPERATED SWITCH

HALF PRICE! BE QUICK, 500 ONLY.



19.5mm mounting hole required. Supplied with two keys. Hundreds of applications for security type applications.

S2500 **$3.50**

DIL SWITCHES

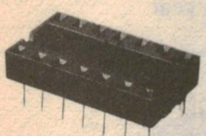
GOLD PLATE SELF-WIPING CONTACTS.

LAST MONTH AT THIS PRICE

		EA	10Up
S 3050	4 Way	**$1.50**	**$1.35**
S 3060	8 Way	**$2.00**	**$1.75**

IC SOCKETS DIL

LOW PROFILE



TOP QUALITY MADE IN USA

	ea.	10 +	25 +
P 0550 8 Pin	.25	.20	.18
P 0560 14 Pin	.30	.25	.20
P 0565 16 Pin	.30	.25	.20
P 0567 18 Pin	.40	.35	.30
P 0570 24 Pin	.60	.50	.45
P 0575 40 Pin	.80	.70	.65

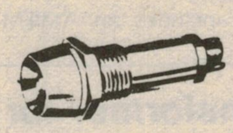
RUBBER GROMMETS

FOR CHASSIS TO 16 GAUGE.
BUY BULK — SAVE 40%.

	Chassis Hole	Cable Hole	Pack Qty.	Price
H 1450	9.5mm	6 mm	8	$ .85
H 1452	9.5mm	6 mm	100	5.95
H 1456	12.7mm	9.5mm	8	.95
H 1458	12.7mm	9.5mm	100	6.00

LED BEZEL 2 VOLT

CHROME BEZEL HOUSING

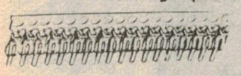


FOR THAT TOUCH OF CLASS

S 4030 (Red) 75   10 Up 65
S 4032 (Green) . . .85   10 Up 75

MOLEX PIN SOCKETS

For use with single pins up to .5mm diam.



Make your own sockets for IC's, displays, LSI's etc.

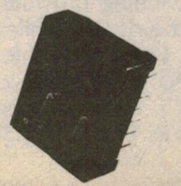
P0700 Pack of 100 $ 2.00
P0701 Pack of 1000 $16.50

Supplied on "Break off" header pre-spaced .1 inch.

GET A TRADE PACK FOR YOUR WORKSHOP NOW.

HIGH INTENSITY 7 SEG. DISPLAYS

FAIRCHILD FND 570's EQUIVALENT TO FND 500

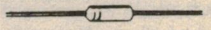


ONLY . . . **$1.95** EA.
NORMALLY $3.95.

LIMIT OF 20 PER CUSTOMER.

ZENNER DIODES 1 WATT

LAST CHANCE AT PRE-DEVALUATION PRICES



All One Price 35   10 up 30

Z 0303	3V3	1N4728	Z 0330	11V	1N4741
Z 0306	3V6	1N4729	Z 0332	12V	1N4742
Z 0308	3V9	1N4730	Z 0334	13V	1N4743
Z 0310	4V3	1N4731	Z 0336	15V	1N4744
Z 0312	4V7	1N4732	Z 0338	18V	1N4746
Z 0314	5V1	1N4733	Z 0340	20V	1N4747
Z 0316	5V6	1N4734	Z 0342	22V	1N4748
Z 0318	6V2	1N4735	Z 0344	24V	1N4749
Z 0320	6V8	1N4736	Z 0346	27V	1N4750
Z 0322	7V5	1N4737	Z 0348	30V	1N4751
Z 0324	8V2	1N4738	Z 0350	33V	1N4752
Z 0326	9V1	1N4739	Z 0352	36V	1N4753
Z 0328	10V	1N4740	Z 0375	75V	1N4761

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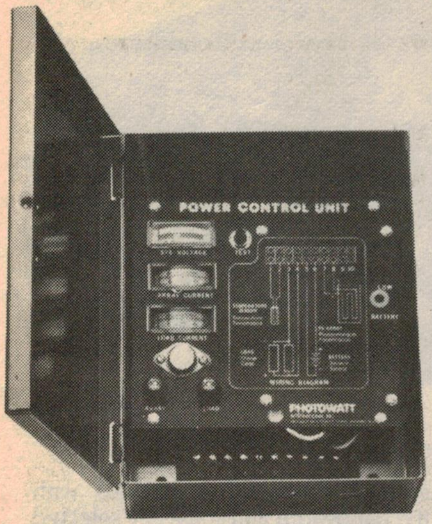
Control unit for photovoltaic systems



Amtex Electronics has released a power control unit for photovoltaic installations.

The power control units direct solar generated electricity to and from battery storage. They also protect the battery and provide monitoring information to the user. Three meters are incorporated to show voltage, current from the array and current drawn by the load.

In the direct charging mode the power controller feeds the full output of a solar array to a battery bank until a preset cut-off point. The controller then enters a trickle charge mode using a reduced current to prevent overcharging the batteries. Conversely when the batteries are low, the controller will automatically disconnect designated "low priority" loads to avoid deep discharge of the batteries. Battery temperature sensing and temperature compensation is also provided.

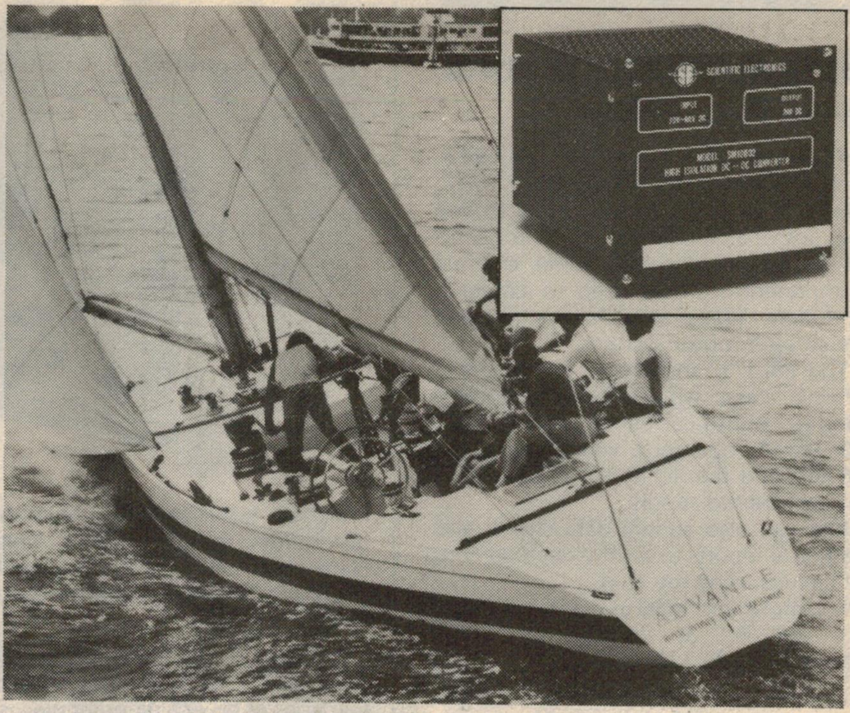
Designated the MC8020, the power controller is housed in an oil-tight NEMA enclosure suitable for outdoor installation even in extremely harsh environments. Models are available for either 12V or 24V operation at a maximum 15A charging current.

Also available from Amtex is a new DC to DC converter designed to operate 12V equipment from a 24V DC supply. The unit incorporates a constant voltage circuit for suppressing output voltage variations and is protected against short circuits and over-current conditions.

Specifications of the converter include an input voltage from 18-35V DC, an output of 13.5V plus or minus 0.3V and a rated current output of 4A continuous (5A peak).

For further information on the photovoltaic power controller or the new converter contact Amtex Electronics, PO Box 285, Chatswood, NSW, 2067. Phone (02) 411 1323.

Power supply for Cup challenger



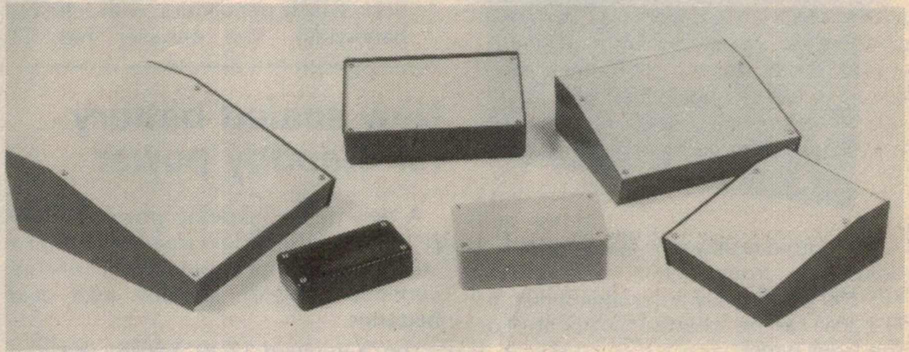
An Australian designed and manufactured power supply is on board one of Australia's challengers for the America's Cup at Newport, Rhode Island.

The 12-metre yacht Advance, sponsored by the Royal Sydney Yacht Squadron, carries a 100W DC-to-DC converter manufactured by Scientific Electronics to power its on-board minicomputer.

The converter, Model SM100D2, was chosen because of its high efficiency, low input voltage and compact packaging.

Scientific Electronics manufactures a wide range of power supplies and DC converters for all types of equipment. For information on the full range contact the company at 6 Holloway Drive, Bayswater, Vic. Phone (03) 762 5777.

Dress up projects with new Jaycar boxes



Shown above are part of the range of new style project boxes available from Jaycar. Two designs are available, both in a variety of sizes and a choice of four colours. At left in the photo is the largest "console box", measuring 170 x 214 x 82mm (W x D x H), with a sloping front panel and a height of 32mm at the front of the box.

All console boxes come with an aluminium front panel and a base and sides of impact resistant ABS plastic. The front panel has moulded-in bushes to take metal screws and each box has internal slots formed in the sides to hold printed circuit boards.

Rectangular ABS boxes can also be supplied, as shown above. Sizes range from 100 x 50 x 25 (L x W x D) to 190 x 110 x 60mm, in blue, black, orange or grey.

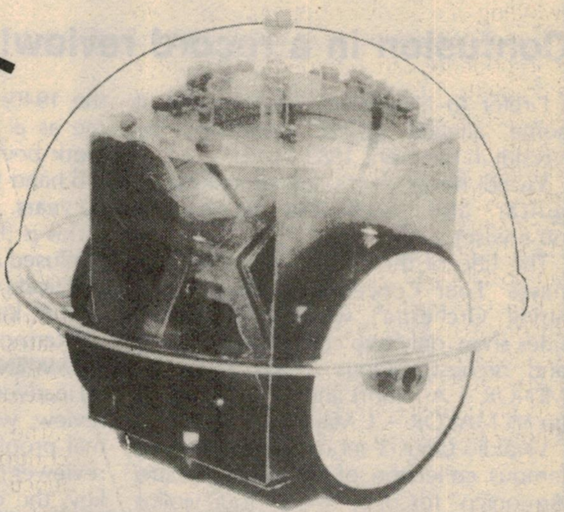
Prices start at $6.95 for the smallest console box or $3.95 for the smallest rectangular type, and further information is available from Jaycar, 125 York St, Sydney, NSW, or at Carlingford, Cnr Carlingford & Pennant Hills Rd.

JAYCAR

Robot Turtle Hebot 11

NEW

The HEBOT 11 turtle is not just a fun device, it is a positive aid to education, it takes programming out into the real 3 dimensional world instead of the flat two dimensional world of the VDU. When connected to the I/O ports of your computer and given a DC supply of 9–15V the turtle runs around under computer control moving forwards, backwards, right and left with independent control of each wheel, it has blinking eyes, will bleep with a choice of two tones and when ordered by the computer, presses down a pen to chart its progress and provide hard copy of the results of the program. When set free to run around the turtle discovers its enviroment. When the turtles shell bumps into an unmovable obstacle touch sensors send back data to the computer for it to calculate evasive or exploratory action.
If the computer has no I/O ports it doubtless has an expansion bus and the turtle can be controlled and listened to using this bus together with the universal computer interface board. This board enables the turtle to be treated as a memory mapped I/O device.



COMPLETE "HEBOT II" KIT INCLUDING ALL HARDWARE, DOME, WHEELS etc. Cat. XR1020

$399 inc tax

Brand new

UNIVERSAL INTERFACE CARD KIT Cat. XR1022

$39.50

16 BIT COLOUR COMPUTER KIT

NEW

At last a high quality 16 BIT micro (mini?) Computer Kit is available in Australia. This extremely powerful machine is based on the Texas TMS9995 processor.
We simply do not have room to list all of the features of this machine. A few:

- High speed 24K byte extended basic interpreter
- 48 bit floating point gives 11 digit accuracy
- High resolution (256 x 192) colour graphics
- Screen memory does not use up user memory space
- 16 colours available on the screen together in Graphic mode
- Fast line drawing and point plotting basic commands
- High speed colour shape manipulation from basic
- Full textual error messages
- String and Array size limited only by memory size
- Real time clock included in basic
- Interval timing with 10mS resolution via TIC function
- Named load and save of basic or machine code programs
- Auto-run available for any program
- Powerful machine code monitor
- Assembler and Disassembler included as standard
- Auto line numbering facility
- Full renumber command
- Simple but powerful line editor
- Buffered I/O allows you to continue executing the program while still printing
- Flexible CALL statement allows linkage to machine code routines with up to 12 parameters
- Basic programs may contain spaces between key-words to make programs readable without using more memory
- Over 34K bytes available for basic programs even when extended basic includes IF-THEN-ELSE
- Supports up to 16 output devices: Screen and cassette included as standard
- Supports bit manipulation of variables from basic
- Error trapping to a basic routine included
- Basic supports Hexadecimal numbers
- Includes UHF modulator, tape interface and power supply with extra capacity for extra interfaces

If you want to know more about this machine send SAE for more details.
(Disc drives NOT included)

COMPLETE KIT INCLUDING METALWORK Cat. KJ3660

$1299

Low Cost Super Value

RS-232 INTERFACE Cat. KJ6631

$49.50

FM Transmitter Module

NEW

We have been working on this one for years!!
Basically we wanted something akin to the $6.50 kit "wireless microphone" transmitter but with greater signal strength and far, far greater frequency stability.
WE NOW HAVE IT!
Basically the (potted) unit measures a small 90 x 22 x 15mm and has connections for power, antenna and input. An AC signal between 20 and 15kHz will modulate the transmitter. The signal can be coded single or multiple frequency tone bursts etc.

FEATURES

- Ultra low noise output (-60dB or better attainable with a suitable tuner)
- Excellent frequency stability
- Not a kit – ready for immediate use
- Connections required
  (a) Power supply or battery
  (b) Antenna
  (c) Audio input
- Full instructions supplied
- Suits any application where a stable low noise FM link is required

SPECIFICATIONS

- Frequency – 88 - 108MHz adjustable
- Useable range – 50 metres
- Supply – 6 to 9V at 20mA
- Input sensitivity – adjustable – maximum 30mV
- Pre-emphasis – 50µ/second standard
- Dimensions – 90 x 22 x 15mm (approx)

$49.95 Cat. DT5450

WIRELESS GUITAR LINK

Cat. AZ5010

SAVE $50

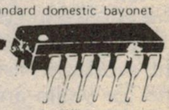
We have made a SCOOP PURCHASE of the MUSOLINK FM Wireless system.
The MUSOLINK enables a guitarist (for example) to operate live without trailing cables. This low cost system transmits a rock-steady signal to any commercial FM tuner. The signal is restricted to the largely unused low end of the 88 - 108MHz FM band. Many MUSOLINKS can be used in, say, 1MHz of FM band width as they have excellent frequency stability.
Normally this unit sells for $149 but we have bulk purchased and now pass on great savings!!

NOW $99 LIMITED STOCK NEW LOW PRICE

BACK AGAIN! ULTRA VIOLET LAMPS $3.95

Ultra violet lamps – New "Mini Flood" design. Powerful 100 watt rating. Standard domestic bayonet fitting. Cat. SL2680

CMOS SENSATION



Huge scoop buy of the scarce 4026AE device means that you save!
For years the 4026 decade counter/7 segment decoder driver has been one of the most difficult parts to obtain. Jaycar has made a scoop purchase of this device in the "AE" form (we are not certain that it was ever made as a "B" suffix device). It has been largely replaced by the 4426 (which is not an exact equivalent). The 4426 sells for $2.20 and so to does the 4026 when it is available but for JULY only the 4026 price has been slashed. Cat. ZC4026. Prices INCLUDES sales tax.
1 – 9 $1.50 each   10 – 99 $1.25 each   100+ ONLY 99 cents each

SEE JAYCARS OTHER ADS FOR ADDRESS DETAILS

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LOGIC PROBE
★ Directly powered from circuit under test (5V)
★ Tested to 12.6 MHZ ★ DTL/TTL — CMOS Threshold selector
★ Circuit loading 30UA approx.
★ High-Low — pulse or memory led indication. Impulse mode pulse length is extended to enable visual observation. In memory mode any detected level is continuously displayed until reset.
LOGIC PROBE
3800A $26.50
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Max Input 1.5 MHz
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A transformer powered soldering station, complete with a low voltage, temperature controlled soldering pencil. The Special Weller features a 'closed loop' which controls maximum tip temperature, thereby protecting temperature sensitive components while the grounded tip protects voltage and current sensitive components. Features: ● quick connect/disconnect plug for the soldering iron ● extra large wiping sponge ● tip tray to store extra tips ● 2m flexible 3-wire power cord.
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● Bandwidth DC ~ 15 MHz
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● Sweep Time 0.5 µs/div ~ 0.5 s/div
● A vertical amplifier provides as wide a bandwidth as DC to 15 MHz, as high a sensitivity as 10 mV/div and a low input capacitance ● A sweep rate extends from 0.5 µsec/div to 0.5 sec/div in 19 ranges Further, TV vertical and horizontal syncs are available for measuring video signals and, with its x5 magnified sweep, its range of application is extremely wide ● Very easy X-Y operation of high input sensitivity for Lissajous measurements ● Dimensions: 260(W) x 190(H) x 385(D) mm; Weight: 8.4 kg
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The Name is JIFFY
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Plated Strips-Alpha Numeric Grid, the most versatile board of the lot. Etched copper strips are pre-drilled and plated for soldering ease These boards have an Alpha Numeric Grid to facilitate positive Pin identification.
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FOR PC WORK
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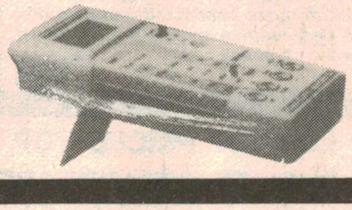
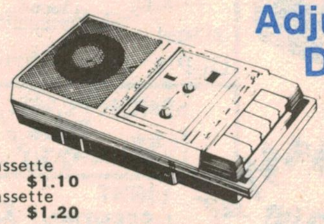


$45



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Now you can save and load software in your Micro with confidence.

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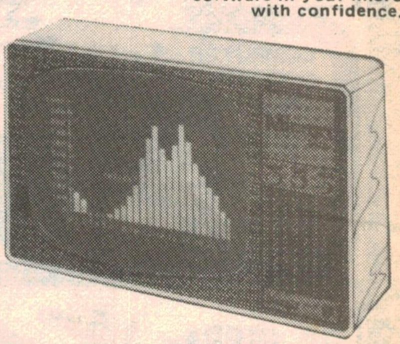
Green Phosphor Monitor
Features: 12" screen Front controls, on/off, contrast/reverse, brightness, Power: 240V/ 50Hz or 12V DC. Input: RCA type, DC Output Jack: 12V/1.1 Amp — power your Micro direct without a power pack. Bandwidth: 10Hz to 20MHz the resultant definition is truly amazing for a low cost monitor.



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8 Ohm 8 Watt RMS 5.6 oz magnet.

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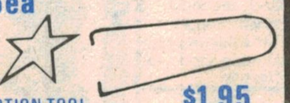

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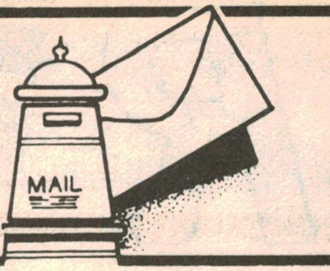


Letters to the editor

Confusion in a record review!

I refer to Neville Williams' review of some alleged Guitar Concertos by Vivaldi in the April 1983 issue.

Vivaldi never wrote any concertos for guitar and orchestra (string or otherwise).

The title of the record reviewed promises "Four Concertos for Guitar and String Orchestra" whereas the listed titles show only two concertos for guitar and orchestra Opus 3 No. 6 (in LA MENOR – A Minor) and Opus 3 No. 12 (in MI MAYOR – E Major).

Vivaldi's Opus 3 set of concertos is the famous collection of 12 works "L'Estro Armonico" for one, two or four violins and strings and continuo of which Nos 6 and 12 happen to be for solo violin.

"L' Estro Armonico" has been recorded frequently enough over the LP era and in fact a very recent release (Christopher Hogwood and the Academy of Ancient Music – Lyre Bird Recordings) accommodates all 12 concertos on two (2) long playing records.

Each concerto as printed in the review has an initial Allegro movement shown as an incredible 38′ 15″ and 38′ 55″ respectively. The average playing time in other versions would be nearer to four minutes for these initial Allegros. Should there be only two concertos on the recording as set out in the review details (and not four works as promised) we would thus have two concertos each of about a 10 minute length on an entire 12-inch disc.

One is left wondering why anyone would bother buying a recording of only two concertos from Vivaldi's Opus 3 played on the wrong instrument on one LP record whereas one could purchase all 12 concertos on 2 LPs played on the correct instruments on the Lyre Bird recording.

One is also left wondering whether Mr Williams actually listened to the recording prior to recommending it, in view of the confusion concerning the number of concertos on the disc and the length of the works, whilst the solo part was written for violin and not guitar, a fact not mentioned in the review.

I should add that I have been a faithful reader of the Classical Record reviews in your excellent magazine since the days when John Moyle was the reviewer (in the 1940s as "Radio and Hobbies" with me as a 10-year-old reader), the good work being carried out by that reliable old hand Julian Russell for the past 15 or 20 years.

This is the first review that has left me confused and I think merits some sort of clarification.

Mr R. Kennedy
Artarmon, NSW

COMMENT: The timing error was due to an inadvertent typing error in the original review, which slipped through our normal proof reading procedures. Had the reviewer more deft in the use of the shift key, the copy would have read 3′ 15″ and 3′ 55″ instead of 38 15″ and 38 55″. Also a complete segment is missing: After the paragraph beginning "If my translation of the Spanish . . ." the missing paragraph should have read: "On side two are two more concertos, both transcribed by guitarist Emilio Pujol: CONCIERTO EN RE MAYOR and CONCIERTO EN LA MAYOR."

This would have made the transcription virtually self-evident. Total playing time for the album is 40′ 38″. We certainly did listen to it and stick by our verdict, although we must apologise for the mess-up!

Nuclear explosions — other observations

Your recent feature article concerning the electromagnetic effects of a nuclear explosion, and the high altitude tests at Johnston Island in 1962, called to mind the dramatic effects the relatively small weapons used in that experiment had on radio propagation. At that time I was employed by the CSIRO and that organisation, together with many similar bodies throughout the world, had equipment set up to monitor as much of the spectrum as possible. One signal that was being observed was NBA in Panama. If I remember correctly this was a US Navy station with similar time-standard and frequency uses as WWV.

The signal path to Australia followed two routes, one straight across the Pacific, and the other around the world; to come in from the south. These two signals exhibited a phase shift and it was startling to see the recording pen, tracing this phase shift, shoot off the chart paper at the instant of the bomb's detonation, not to return for more than 24 hours, with no trace of a signal.

Other effects of the excess electrons from the explosion being injected into the ionosphere and becoming trapped by the earth's magnetic field were aurora withinin a few degrees of the equator instead of being confined mainly to the extreme northern and southern latitudes, and measurable effects on short-wave communication for almost a year.

Another large scale experiment of this era which, fortunately, failed was "Project West Ford", proposed by the MIT Lincoln laboratory in 1960 and launched shortly after. This was an attempt to place in both equatorial and polar orbits, a cloud of fine copper wires to act as a radio mirror for reliable long range traffic.

Despite protest from both optical and radio astronomers, the launch took place. The idea was to cast the copper wires in a block of camphor, which when exposed to the vacuum of space, would sublimate, thus spreading the wires as the block orbited the earth.

The payload reached orbit but disappeared without a trace. With so much of our communications depending on satelites, such electronic "smog" would be inexcusable.

Norman J. Marks
Pennant Hills, NSW

Touch-Lamp Dimmer: a legal point

In regard to your project, "Touch-Lamp Dimmer (April, 1983), I feel that it should have been said that it is illegal to alter an electrical installation unless you are a holder of an appropriate licence. To install the Touch-Lamp Dimmer without a licence would, in most cases, be illegal.

Although it is illegal, many unlicensed people change their light fittings, eg from a cheap light fitting to a more elaborate one. This can be dangerous because:

(1) Even with the light switch off, there is usually a live conductor at the fitting, because of looping.

(2) Not all black wires are neutral; in a lot of cases one is an active switch wire.

I heard of one person who fell into these traps when trying to change a light fitting. He first turned the light off at the switch and commenced to disconnect the fitting. He received a shock, so decided to turn the power off at the main switch.

He connected the new fitting with all red leads together and all black leads together, then switched on. This immediately blew the fuse. At this point he called in a licensed tradesman.

A. T. Morgan,
Crystal Brook, SA.

New Products

Stepper motor control with two chips

Rifa now has available a monolithic stepper motor drive circuit, the PBL3717, designed to control drive current to one winding of a bipolar stepper motor. Two of the new chips and some external components can be used to create a complete TTL-compatible control unit for stepper motor systems.

The PBL3717 includes a bi-directional driving stage with in-built protection diodes, control current capabilities from 20-500mA, operating voltage range of 10-40V and the ability to operate from an unstabilised supply.

Rifa can also supply data sheets and technical reports to aid the development of circuits using the chip.

For more information contact Rifa Pty Ltd, 202 Bell St, Preston, Vic. 3072. Phone (03) 480 1211.

Heavy duty power supplies from Imark

Imark now has available two models of Alinco heavy duty power supplies, imported from Japan. The EPS-200 and EPS-20M power supplies provide 15A continuous (20A maximum) current at 16V DC.

The output voltage on both models is adjustable from 9-16V. The model EPS-200 is internally adjustable while the EPS-20M can be adjusted by a control on the front panel.

All models feature automatic overload protection as well as short circuit shut down circuitry. The supplies are housed in an all-metal cabinet with output terminals mounted on the front panel.

Brief specifications are input voltage 240V AC, output voltage 9-16V DC, maximum DC current 20A, ripple voltage 30mV p-p and weight 7.5kg. Dimensions are 278 × 266 × 152mm.

Further details are available from Imark Pty Ltd, 167 Roden Street, West Melbourne, 3003. Phone (03) 329 5433.

Communications receivers from Vicom

Vicom International, Australian distributors for IFR of the United States, now has available the new IFR FM/AM-1500 radio communications service monitor.

The monitor is a microprocessor-controlled instrument integrating the functions of several different pieces of test equipment into a single portable unit. A keyboard is used for data entry with an LCD frequency readout and a CRT display capable of displaying alphanumeric or waveform information. A menu of functions is used to select between monitoring facilities, including programmable RF and audio frequency settings and tests in areas as diverse as scanning performance and cable integrity.

Features of the unit include a full scan 1-1000MHz spectrum analyser which includes a minimum scan position of 1kHz per division with a 300Hz bandwidth. The analyser has 11 calibrated dispersion sections with the bandwidth automatically selected with the analyser dispersion setting. The centre frequency of the analyser is phase-locked to the centre frequency of the receiver under test.

Also available from Vicom is a new commercial receiver manufactured by United States company IRC. Features of the NRD-95 receiver include a frequency synthesiser which can tune to any frequency within the range of 90kHz to 29.99999MHz in 10Hz steps. A "fine step" control is also provided to enable the tuning frequency to be selected in 1Hz steps.

An internal microprocessor provides flexible control features including pre-set reception channels and a remote control through a voice grade line.

For further information contact Vicom International Pty Ltd, 57 PO Box 366, South Melbourne, Vic. 3205. Phone (03) 62 6931.

New sealed battery for standby power

A new sealed standby power battery released by Chloride is claimed to offer a cost per watt hour about half that of conventional long-life standby lead acid batteries.

The "Safeguard 12/30" battery uses the latest recombination electrolyte technology not only to give an economical rechargeable energy source in float/recharge applications but also to eliminate topping up, spillage, seepage, corrosion, emissions and explosion risk, as well as easing handling, shipping and mounting. The Safeguard 12/30 is suitable for emergency lighting systems, switchgear control, uninterruptible power supplies, standby engine/generator starting, remote instrumentation stations, communications equipment, alarm and security systems.

The absence of free electrolyte within the battery eliminates the major risks of injury to people or damage to equipment involved in battery use. According to Chloride, the Safeguard is regarded by the airlines and flight charter operators as acceptable for air freighting, unlike many batteries.

Safeguard's light weight also allows low freight costs and eases handling and installation.

The battery is said to be equally capable of delivering energy to meet low current demands over long periods or to meet spasmodic high power demands over short periods as in engine starting control and computer power support systems.

For further information contact Chloride Australia, 147-149 Woodpark Rd, Smithfield, NSW. 2164, or branches in other capital cities.

New Products...

Product reviews, releases & services

Install your own telephone accessories

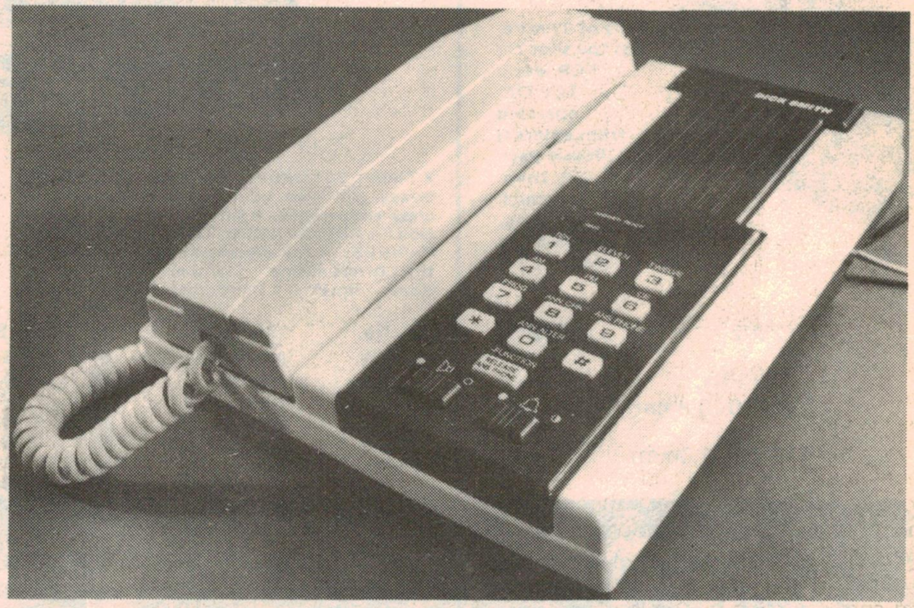
The recent change in Telecom procedures has led to a boom for telephone equipment suppliers.

According to a spokesman for Dick Smith Electronics, the new rules on connecting devices to the telephone lines mean that any Telecom type-approved equipment which substitutes for the Telecom handset can be connected to the phone lines by the user. Products in this class include telephone answering machines, cordless telephones and any of the host of push-button phones now available.

Equipment which is used in conjunction with the standard handset (not in place of the telephone) must still be installed by a Telecom technician. These devices include add-on pushbutton and automatic digital diallers.

Dick Smith Electronics, as one might expect, has a wide range of innovative telephone equipment with the required Telecom approval numbers. Where necessary the devices are also accompanied by the appropriate application form for Telecom installation.

Included in the range are single and dual tape telephone answering machines, the "Freedom" cordless telephone, a low-cost push-button replacement phone called the "PAL" and a new automatic phone which memorises eight seven-digit phone numbers and four 12-digit (STD) numbers and will re-dial the last number called at the push of a button, play music for callers placed on hold and time the length of phone calls.



The call diverter uses synthesised speech to tell callers how to contact you.

New equipment includes an AM/FM clock radio with built-in push-button telephone. Along with a telephone with last number re-dial, a mute switch, adjustable ring volume and a LED "in-use" indicator, the instrument includes an AM/FM radio and a digital alarm clock with all the usual features. Battery back-up is provided for clock and alarm functions and the radio is automatically muted when the telephone rings or is used to dial out.

Also new is a "call diverter" which will tell callers where you can be reached — or to ring back later. The device does not use taped messages but includes a microprocessor controlled speech synthesiser with a choice of three pre-programmed messages. Of course the unit also functions as a normal push-button phone, with an added feature which allows the user to enter a phone number for the next call while still speaking with the current caller. At the push of a button the phone will automatically dial the stored number.

The products mentioned here are available at selected Dick Smith stores throughout Australia. A number of other products are also in preparation and will be available later this year.

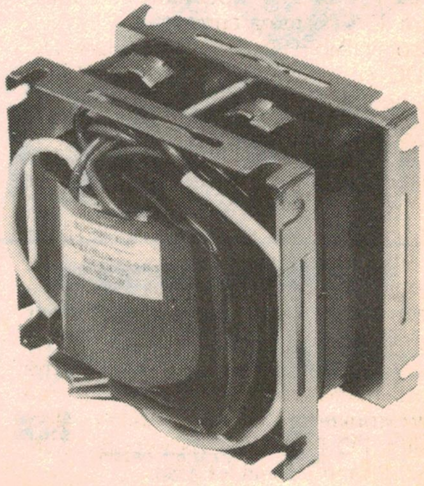
300VA transformer for inverter units

Selectronics Components Pty Ltd now has available a range of stepdown transformers for operating imported equipment on 115V/50Hz. A 240V mains isolation transformer is also available to avoid the risk of injury when working on transformerless equipment. All units are "stand-alone" and supplied with two metres of cord, mains plug and output socket. They comply with Australian standard AS126.

Also available from Selectronics is a new 300VA inverter transformer, the X1169. An improved version of Selectronics' previous inverter transformer, the new component is specifically designed to be used in conjunction with an inverter circuit operating from a 12V DC supply and using pulse width modulation for output regulation.

Features of the transformer include "C" core construction, either horizontal or vertical mounting and a single primary winding for increased efficiency and easy installation. The secondary provides a nominal 230V 50Hz and an auxiliary 12V winding provides a means of sampling the output while maintaining isolation.

For further information contact Mr B. Scott, Selectronic Components Pty Ltd, 25 Holloway Drive, Bayswater, 3153, Vic. Phone (03) 762 4822.



7400

7400	.25
7402	.25
7403	.25
7404	.29
7406	.37
7407	.37
7408	.27
7410	.29
7411	.29
7413	.35
7414	.35
7416	.41
7417	.41
7420	.25
7421	.29
7423	.32
7425	.34
7426	.32
7427	.35
7430	.25
7432	.35
7437	.29
7438	.34
7440	.29
7442	.44
7444	.89
7445	.79
7446	.62
7447	.69
7448	1.16
7451	.25
7454	.25
7470	.42
7472	.37
7473	.46
7474	.35
7475	.46
7476	.29
7483	.55
7485	.69
7486	.42
7489	3.50
7490	.49
7492	.51
7493	.49
7495	.44
7496	.59
7497	.99
74107	.34
74122	.59
74123	.47
74125	.39
74126	.57
74145	.44
74147	1.95
74148	1.10
74150	1.29
74151	.45
74153	.39
74154	1.45
74155	.49
74156	.83
74157	.47
74160	1.12
74161	.61
74162	1.20
74163	.59
74164	.66
74165	.79
74166	.99
74167	2.20
74174	.59
74175	.47
74176	1.10
74177	1.10
74180	.45
74182	.94
74184	3.30
74190	.59
74191	.99
74192	.69
74193	.79
74194	.62
74195	.52
74196	.64
74197	.63
74198	1.45
74199	1.55
74221	1.50
74251	1.30
74279	.47
74283	.69
74290	.62
74293	.85
74298	.66
74365	.83
74366	.83
74367	.83
74368	.83

74LS00

74LS00	.24
74LS01	.29
74LS02	.24
74LS03	.24
74LS04	.24
74LS05	.29
74LS08	.24
74LS10	.24
74LS11	.26
74LS12	.28
74LS13	.29
74LS14	.32
74LS20	.29
74LS21	.29
74LS26	.29
74LS27	.26
74LS30	.27
74LS32	.25
74LS33	.33
74LS37	.32
74LS38	.32
74LS40	.26
74LS42	.45
74LS47	.54
74LS48	.49
74LS49	1.50
74LS51	.25
74LS54	.27
74LS55	.28
74LS73	.32
74LS74	.35
74LS76	.44
74LS83	.49
74LS85	.49
74LS86	.41
74LS90	.45
74LS92	.55
74LS93	.35
74LS95	.52
74LS96	.79
74LS107	.44
74LS109	.34
74LS112	.39
74LS122	.59
74LS123	.59
74LS125	.40
74LS126	.53
74LS132	.45
74LS136	.32
74LS138	.45
74LS139	.48
74LS151	.47
74LS152	.60
74LS153	.42
74LS154	1.49
74LS155	.45
74LS156	.45
74LS157	.40
74LS158	.40
74LS160	.59
74LS161	.52
74LS162	.50
74LS163	.50
74LS164	.50
74LS165	.59
74LS170	.79
74LS173	.61
74LS174	.52
74LS175	.44
74LS181	.83
74LS190	.79
74LS191	.79
74LS192	.50
74LS193	.64
74LS194	.50
74LS195	.51
74LS197	.53
74LS221	.65
74LS240	.82
74LS241	.85
74LS242	.79
74LS243	.72
74LS244	.79
74LS245	1.10
74LS248	.52
74LS249	.82
74LS251	.55
74LS253	.52
74LS257	.49
74LS258	.47
74LS259	.79
74LS266	.39
74LS273	.89
74LS279	.44
74LS283	.44
74LS290	.50
74LS293	.64
74LS298	.54
74LS352	.59
74LS365	.49
74LS366	.49
74LS367	.49
74LS368	.49
74LS373	1.10
74LS374	.89
74LS375	.49
74LS377	1.10
74LS378	.52
74LS390	.75
74LS393	.64
74LS447	.55
74LS629	2.95
74LS640	1.70
74LS670	.99
81LS95	1.85
81LS96	1.85
81LS97	1.85
81LS98	1.85

74F00

74F00	.75
74F02	.75
74F04	.75
74F08	.75
74F10	.75
74F11	.75
74F20	.75
74F32	.75
74F64	.75
74F74	.80
74F86	1.10
74F109	.96
74F138	1.58
74F139	1.58
74F151	1.58
74F153	1.58
74F157	1.58
74F158	1.58
74F175	2.46
74F181	4.35
74F182	2.30
74F189	6.80
74F190	3.60
74F191	3.60
74F194	2.15
74F241	3.15
74F243	3.92
74F244	3.15
74F251	1.75
74F253	1.75
74F257	1.75
74F258	1.75
74F350	3.20
74F352	1.75
74F353	1.75
74F373	3.60
74F374	3.60
74F399	2.50
74F521	3.80
74F533	3.60
74F534	3.60

74S00

74S00	.40
74S02	.47
74S03	.47
74S04	.40
74S05	.44
74S08	.44
74S10	.44
74S11	.42
74S15	.59
74S20	.42
74S30	.47
74S32	.49
74S40	.50
74S51	.42
74S64	.45
74S74	.50
74S86	.58
74S112	.68
74S113	.78
74S132	.58
74S133	.45
74S134	1.70
74S135	2.20
74S138	.78
74S139	.88
74S140	.42
74S151	.88
74S153	.88
74S157	.78
74S158	.80
74S161	4.50
74S174	.78
74S175	.85
74S188	2.80
74S189	2.85
74S194	1.50
74S242	3.95
74S253	.85
74S257	.93
74S258	.99
74S283	1.60
74S287	2.90
74S288	2.80
74S289	3.10

74C00

74C00	.45
74C02	.45
74C04	.40
74C08	.40
74C10	.40
74C14	.40
74C20	.40
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74C32	.40
74C42	1.25
74C48	1.65
74C73	.70
74C74	.90
74C83	2.10
74C85	1.20
74C86	.35
74C89	3.70
74C90	1.40
74C93	1.40
74C95	1.50
74C107	1.05
74C150	3.40
74C151	2.90
74C154	4.65
74C157	2.60
74C160	1.30
74C161	1.05
74C162	1.25
74C163	1.20
74C164	1.50
74C165	1.65
74C173	1.79
74C174	.79
74C175	.90
74C192	1.55
74C193	.95
74C195	1.65
74C200	12.95
74C221	1.65
74C240	2.35
74C244	2.60
74C373	2.60
74C374	2.50
74C901	.85
74C902	.80
74C903	.75
74C904	.75
74C906	.75
74C907	.75
74C908	1.50
74C910	12.95
74C911	11.85
74C912	12.50
74C914	2.20
74C915	1.95
74C917	12.00
74C918	1.80
74C920	5.60
74C922	5.60
74C923	5.40
74C925	7.50
74C926	7.90
74C927	6.80
74C928	8.00
74C929	4.20
74C930	4.20
74C941	2.25
74C989	8.60

4000

4000	.26
4001	.26
4002	.26
4006	.68
4007	.25
4008	.70
4009	.66
4010	.62
4011	.25
4012	.25
4013	.30
4014	.77
4015	.65
4016	.39
4017	.66
4018	.78
4019	.44
4020	.66
4021	.79
4022	.66
4023	.25
4024	.48
4025	.28
4026	1.05
4027	.39
4028	.73
4029	.84
4030	.42
4031	2.50
4033	1.80
4034	1.80
4035	.90
4040	.65
4041	1.00
4042	.65
4043	.80
4044	.50
4046	1.05
4047	.80
4048	.46
4049	.35
4050	.35
4051	.72
4052	1.15
4053	.80
4055	2.20
4060	1.10
4063	1.10
4066	.40
4068	.28
4069	.25
4070	.25
4071	.25
4072	.26
4073	.26
4075	.82
4076	.30
4077	.25
4081	.28
4082	.60
4085	2.10
4086	.70
4089	1.20
4093	.80
4094	.80
4099	1.10
4104	1.10
4160	.80
4161	.80
4163	
4174	
4175	
4194	
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4411	12.00
4419	3.40
4469	13.50
4495	2.70
4500	5.80
4502	.88
4503	
4507	.68
4508	1.20
4510	.80
4511	.80
4512	.80
4514	1.70
4515	2.50
4516	.85
4518	.80
4519	.68
4520	.80
4521	2.00
4522	1.14
4526	1.00
4527	
4528	
4529	.84
4531	1.24
4532	1.04
4534	1.26
4538	6.00
4539	1.00
4541	.60
4543	1.10
4553	.94
4555	3.00
4556	.60
4558	.65
4560	1.40
4566	2.50
4569	2.10
4572	.60
4583	1.00
4584	.60
4585	.80
4599	4.20

9000

9300	.60
9302	.60
9304	.62
9307	1.50
9308	1.90
9309	.64
9310	.88
9311	1.69
9312	.54
9314	.59
9316	.78
9318	1.40
9320	5.00
9321	.88
9322	.55
9324	.78
9328	.99
9334	1.18
9338	1.30
9340	2.85
9368	1.18
9370	.94

LINEAR ETC.

AD570	58.00
AD7524	14.20
ADC0800	15.00
ADC0804	5.90
ADC0808	14.50
ADC0809	15.50
ADC0817	14.00
ADC1210	67.00
AY-3-1015	7.00
AY-3-8910	10.00
BR1941	12.00
BR1943	12.00
CA3028	1.90
CA3036	3.90
CA3039	1.60
CA3059	3.95
CA3081	.99
CA3130	1.40
CA3130T	1.50
CA3140	.80
CA3140T	1.20
CA3146	2.20
CA3401	.99
DAC0800	3.20
DAC0808	2.50
DAC1220	15.50
DM8121	2.50
DM8130	5.20
DM8131	3.90
DM8309	.64
DM8310	.88
DM8312	.54
DM8316	.78
DS8820	1.50
DS8830	1.70
DS8833	3.90
DS8836	1.50
DS8859	2.05
DS8869	1.80
DS75107	1.20
DS75108	1.20
DS75110	1.20
DS75150	1.14
DS75154	1.14
DS75451	.60
DS75452	.60
DS75453	.60
DS75454	.66
FD1771	18.00
FD1791	32.00
FD1793	32.00
FD1795	35.00
ICL7106	12.50
ICL7107	15.40
ICL7660	4.80
ICM7217A	17.50
ICM7218A	17.50
ICM7555	1.60
ICM7556	2.50
L120	2.25
L121	2.60
LF347	2.05
LF351	.50
LF353	1.00
LF356	1.30
LF357	1.35
LF398	4.80
LF398H	6.00
LF13741	.72
LH0002	9.60
LH00042CH	9.60
LH0070-1H	15.90
LH0071-1H	16.20
LM10CH	6.50
LM304H	3.90
LM307	.50
LM310	2.90
LM311-14	.80
LM318	2.00
LM319	2.10
LM322	2.10
LM325	4.50
LM329	.80
LM334	2.35
LM335Z	1.50
LM336Z	1.50
LM349	1.60
LM358	.70
LM358AN	2.00
LM374	4.80
LM377	2.90
LM380-8	1.20
LM380-14	.90
LM381	2.85
LM382	2.00
LM383	2.90
LM386	.80
LM387	1.95
LM394CH	3.80
LM565	1.05
LM566	2.00
LM567	1.05
LM1830	3.20
LM1886	6.00
LM1889	3.50
LM2917-14	2.80
LM3080	1.20
LM3089	2.90
LM3524	3.40
LM3900	.65
LM3905	1.50
LM3909	1.20
LM3911	2.35
LM3914	3.90
LM3915	3.90
LM3916	4.40
LM4250	2.00
MC1350	1.38
MC1406	9.00
MC1445	3.90
MC1456	1.45
MC1466	13.50
MC1494	7.20
MC1495	6.50
MC1496	1.10
MC3340	1.40
MC3370	3.70
MC3470	9.00
MC3486	3.30
MC10116	1.20
MC66740	16.00
MM5303	6.50
MM5837	3.10
MM58167	14.50
MN3001	16.00
MSM58372	12.50
NE530	2.30
NE558	1.90
NE571	1.90
NE5534	1.45
NE5534AN	1.95
OM321	11.00
OM335	19.50
OM350	9.50
SAB0600	6.50
SAK140	2.00
SN76477	5.65
SN76488	5.95
TA7205	1.80
TCA220	8.50
TL061	.96
TL062	1.55
TL071	1.05
TL072	1.45
TL074	2.40
TL075	3.20
TL081	.60
TL082	1.20
TL084	2.35
TR1602	8.00
TR1863	7.20
TR1983	11.00
UA301	.48
UA301H	1.35
UA305H	1.25
UA308	.58
UA311	.62
UA311H	1.30
UA324	.90
UA339	.90
UA348	1.40
UA393	.52
UA555	.40
UA556	.90
UA709	.58
UA710	.75
UA711	.60
UA723	.45
UA723H	1.30
UA725	.85
UA739	1.75
UA741	.40
UA741H	1.15
UA747	.98
UA1458	.59
UA1488	.85
UA1489	.85
UA2901	.80
UA3086	.50
UA4136	1.30
UAA17	4.60
UAA180	4.60
ULN2003	1.25
WD1393	59.00
WD1691	16.00
XR2206	5.95
XR2207	5.00
XR2208	3.20
XR2211	6.90
XR2216	2.80
XR2240	3.00
XR2243	2.70
8T26	2.00
8T28	2.40
8T95	1.80
8T96	1.80
8T97	1.80
11C90	12.50
95H90	7.00

MICRO

2102	1.80
2112	7.50
2114	1.89
2147	7.50
2532	15.00
2564	
2708	5.90
2716	4.50
27128	75.00
2732	5.40
2764	10.50
2816	11.00
2911	26.50
2912	22.00
2920	118.00
4116 150NS	1.80
4164 150NS	6.00
6116P3	6.50
6502	9.45
6502A	9.80
6505	12.00
6507	8.64
6520	2.99
6522	7.90
6522A	10.80
6532	10.70
6545	19.80
6551	12.90
6800	5.00
6802	6.90
6808	4.50
6809	16.00
6810	3.20
6820	2.85
6821	2.98
6840	5.80
6844	12.50
6845	12.50
6847	7.50
6850	2.50
6852	2.95
6854	8.80
6875	10.50
68A09	34.00
68B00	6.80
68B21	4.50
68B40	8.00
68B45	17.00
68B50	4.00
68B54	12.00
8080	7.50
8085A	7.00
8086	59.00
8088	38.00
8155	6.00
8156	5.50
8185	35.00
8202A	49.00
8203	53.00
8206	108.00
8212	2.98
8214	2.50
8216	2.95
8224	3.90
8226	3.00
8228	5.10
8231	240.00
8237	38.00
8238	9.50
8243	7.00
8251A	4.60
8253	6.90
8255A	5.30
8257	12.00
8259	5.00
8271	79.00
8272	28.00
8273	55.00
8274	41.00
8275	37.50
8276	24.00
8279	6.90
8282	6.50
8283	8.40
8284	6.45
8286	6.45
8287	23.00
8288	59.00
8289	41.00
8291A	32.00
8292	25.80
8293	
Z80CPU	5.40
Z80ACPU	5.90
Z80BCPU	11.00
Z80P10	4.40
Z80AP10	5.80
Z80S10	12.70
Z80AS10	16.00
Z80CTC	5.30
Z80ACTC	6.50
Z80DMA	15.50
Z80ADMA	18.00
8741A	45.00
8748	23.50
8749	55.00
8755A	32.00

VOLT REGS

LM309H	4.10
LM317HVK	6.30
LM337T	1.95
LM337HVK	12.00
LM337K	6.50
LM338K	9.40
LM350K	6.30
LM350T	4.50
LM396K	18.00
LM79L05	.98
LM79L12	.88
LM79L15	.88
SH1605	16.50
UA317T	.98
UA317K	2.60
UA309K	1.80
UA494	4.40
UA7805	.65
UA7805K	1.65
UA7806	.75
UA7808	.65
UA7808K	1.65
UA7812	.65
UA7812K	1.65
UA7815	.65
UA7815K	1.65
UA7818	.70
UA7818K	1.70
UA7824	.65
UA7824K	1.70
UA78H05K	6.45
UA78H12K	8.50
UA78HGKC	9.40
UA78L05	.39
UA78L12	.39
UA78L15	.39
UA78M05	.60
UA78M12	.60
UA78P05K	14.40
UA78540	2.60
UA7905	.72
UA7905K	1.85
UA7908	.72
UA7908K	1.85
UA7912	.72
UA7912K	1.85
UA7915	.72
UA7915K	1.85
UA79HGKC	14.95
UA79M05	.65
UA79M12	.65

OPTO

4N25	.98
4N26	.98
4N28	.98
4N32	.98
4N33	1.30
4N35	.98
MCT6	1.40
MCT2	.95
FND357	1.60
FND500	1.60
FND507	1.60
FND800	3.50
TIL31A	2.50
TIL81	2.00
BPW50	2.00
CQY89	.60
MOC3020	2.20
MOC3021	2.60
MAN72A	1.50
MAN74A	1.50
FCD820C	.90
FCD825C	.90
FCD850C	1.20
FPT100B	1.30
MSM3914	8.50
MSM3916	8.50

LEDS

TLG123 SGS	
3mm GREEN	.18
TLR123 SGS	
3mm RED	.13
TLO123 SGS	
3mm YELLOW	.18
TLG113 SGS	
5mm GREEN	.18
TLR113 SGS	
5mm RED	.13
TLO113 SGS	
5mm YELLOW	.18
Z0160	
RECT. RED	.25
Z0162	
RECT. GREEN	.25
Z0164	
RECT. YELLOW	.25
FLS010	
5mm LED CLIP	.04

DIODES

IN4148	.03
IN914	.03
IN4001	.05
IN4002	.05
IN4004	.06
IN4007	.10
IN5404	.16
IN5408	.18
OA47	.44
OA90	.18
OA202	.88
OA636	.90
P600G	
6A400V	.36
BAW62	.30
BA102	.70
OA91	.20
OA95	.25
IN3492	
25A100V	1.50
IN3492R	
25A100V	1.50
IN5060	.30

BRIDGES

VJ448	
10A400V	1.80
BR154	
15A400V	3.10
BR254	
25A400V	3.95
BR354	
35A400V	4.50
P04	
6A400V	1.25
RS204	
2A400V INLINE	.80
SB204	
2A400V	.75
W04	
1.5A400V	.40

ZENERS

IN4733A	
5.1V 1 WATT	.18
IN4734A	
5.6V 1 WATT	.18
IN4736A	
6.8V 1 WATT	.18
IN4740A	
10V 1 WATT	.18
IN4742A	
12V 1 WATT	.18
IN5349B	
12V 5 WATT	.70
BZX61/C75	
75V 1.3 WATT	.80

TRANSISTORS

AC126	.70
AC127	.60
AC128	.86
AC187	.58
AC188	1.10
AD149	1.90
AD161	1.70
AD162	1.70
AF127	.98
BC107	.30
BC107B	.35
BC108	.30
BC108C	.35
BC109	.30
BC109C	.35
BC177	.35
BC178	.35
BC179	.35
BC212	.20
BC318	.15
BC327	.15
BC328	.15
BC546	.15
BC547	.15
BC547C	.16
BC548	.15
BC548C	.16
BC549	.15
BC549C	.16
BC550	.15
BC556	.15
BC557	.15
BC557B	.16
BC558	.15
BC558B	.16
BC559	.15
BC559B	.16
BC637	.35
BC639	.30
BC640	.30
BCY70	.40
BCY71	.44
BD135	.33
BD136	.39
BD137	.40
BD138	.40
BD139	.32
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BD237	.44
BD238	.44
BD262	.75
BD263	.75
BD437	.46
BD647	1.98
BD677	.62
BD681	.60
BD682	.60
BDV64B	3.10
BDV65B	3.10
BDY96	3.50
BDY97	3.50
BF115	.57
BF167	.57
BF173	.60
BF180	.80
BF184	.70
BF198	.22
BF199	.22
BF337	.50
BF458	.51
BF459	.51
BF469	.80
BF470	.80
BF494	.27
BFY50	.53
BFY90	.72
BU126	1.87
BU208	2.15
BU326A	1.92
BUX80	3.50
MFE121	1.40
MFE131	1.40
MJ413	3.40
MJ802	3.75
MJ1001	2.50
MJ15003	3.65
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MJ2955	1.04
MJ4032	8.32
MJ4035	7.60
MJ4502	4.10
MJE340	.75
MJE350	.85
MJE251	1.25
MJE700	.51
MJE800	.51
MJE2955	1.92
MJE3055	1.76
MPSA05	.19
MPSA06	.19
MPSA12	.19
MPSA14	.19
MPSA42	.19
MPSA56	.19
MPSA92	.19
MPF102	.56
MPF103	.79
MPF105	.79
MRF237	3.90
MRF454	29.00
MRF475	4.50
MRF901	2.80
TIP31	.40
TIP31A	.45
TIP31B	.54
TIP31C	.62
TIP32	.44
TIP32A	.56
TIP32B	.58
TIP32C	.64
TIP41	.66
TIP41A	.70
TIP41B	.74
TIP41C	.76
TIP42	.60
TIP42A	.76
TIP42B	.80
TIP42C	.82
TIP111	.68
TIP112	.75
TIP116	.77
TIP117	.83
TIP120	.66
TIP122	.72
TIP125	.77
TIP127	.96
TIP2955	1.20
TIP3055	1.20
2N301	3.90
2N697	.42
2N918	.42
2N2219	.42
2N2219A	.48
2N2222	.42
2N2222A	.48
2N2369	.42
2N2484	.42
2N2646	.96
2N2647	1.60
2N2894	.36
2N2904	.45
2N2905	.45
2N2905A	.49
2N2906	.40
2N2907	.42
2N2907A	.49
2N3019	.46
2N3053	.46
2N3054	1.74
2N3055	.89
2N3302	.39
2N3440	.80
2N3441	2.50
2N3442	2.30
2N3563	.18
2N3564	.18
2N3565	.18
2N3566	.18
2N3567	.18
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2N3569	.18
2N3638	.18
2N3640	.18
2N3641	.18
2N3642	.18
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2N3646	.18
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2N3704	.25
2N3771	3.20
2N3772	3.60
2N3773	4.30
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2N3904	.20
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2N4033	.70
2N4036	.49
2N4121	.20
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2N4237	1.10
2N4250	.19
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2N4355	.19
2N4356	.19
2N4360	.50
2N4401	.18
2N4402	.18
2N4403	.18
2N4416	1.40
2N4427	.80
2N5088	.18
2N5089	.20
2N5179	1.20
2N5190	.72
2N5191	.74
2N5192	.61
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2N5195	.65
2N5210	.19
2N5245	.70
2N5303	3.65
2N5401	.20
2N5457	.55
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2N5459	.60
2N5461	.66
2N5485	.55
2N5486	.55
2N5590	16.00
2N5591	17.00
2N5770	.19
2N5777	.96
2N5873	1.35
2N5944	14.50
2N5946	19.50
2N5961	.19
2N6027	.55
2N6084	22.00
2N6121	.62
2N6122	.60
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2N6124	.60
2N6125	.66
2N6126	.58
2N6129	1.20
2N6130	1.40
2N6131	1.50
2N6133	1.60
2N696	.90
2N918	.45
25A683	.70
2SC1017	2.60
2SC1061	.70
2SC1096	.72
2SC1106	4.80
2SC1226	.95
2SC1306	1.50
2SC945A	.25
2SD350A	2.25
2SJ49	6.20
2SK134	6.20
3N201	1.80

SCR & TRIACS

C103D	.65
C106D	.80
C122D	1.60
C122E	2.00
C230D	5.90
Q4010L4	1.90
Q4015L5	2.70
Q6010L5	3.20
Q6015L5	3.50
Q6025H	9.80
S4015L5	2.20
S4025H	8.20
SC141D	1.30
SC146D	1.65
SC151D	2.20
ST2	.55
ST4	.65

TANTALUM

1UF/35V	.19
22UF/35V	.19
33UF/35V	.19
47UF/35V	.19
1UF/35V	.20
1.5UF/35V	.20
2.2UF/35V	.22
3.3UF/35V	.23
4.7UF/35V	.41
10UF/35V	.55

ELECTRO PCB

1UF/50V	.15
2.2UF/25V	.15
4.7UF/25V	.15
10UF/25V	.15
33UF/25V	.15
47UF/25V	.15
100UF/25V	.16
220UF/25V	.20
330UF/25V	.25
470UF/25V	.35
1000UF/16V	.40
1000UF/25V	.50
2200UF/25V	.85

ELECTRO AXIAL

47UF/63V	.19
1UF/63V	.19
2.2UF/63V	.19
3.3UF/25V	.19
4.7UF/25V	.19
10UF/160V	.25
10UF/16V	.19
10UF/25V	.19
10UF/63V	.20
22UF/25V	.20
22UF/63V	.20
47UF/16V	.19
47UF/25V	.19
47UF/63V	.20
100UF/25V	.20
100UF/63V	.35
220UF/16V	.20
220UF/25V	.25
220UF/63V	.50
470UF/16V	.39
470UF/25V	.42
470UF/63V	.65
1000UF/16V	.45
1000UF/25V	.52
1000UF/35V	.75
2500UF/16V	.88
2500UF/25V	.98
2500UF/35V	1.60
2500UF/50V	1.98
4700UF/35V	2.50

ELECTRO METAL CAN

2500UF/80V	3.50
4000UF/75V	5.80
5600UF/40V	3.80
8000UF/75V	8.95

ELECTRO BIPOLAR

2.2UF/50V	.35
4.7UF/50V	.38
6.8UF/50V	.39
10UF/50V	.40
22UF/50V	.42

GREENCAPS

.001UF/100V	.12
.0015UF/100V	.12
.0022UF/100V	.12
.0033UF/100V	.12
.0039UF/100V	.12
.0047UF/100V	.12
.0056UF/100V	.12
.0068UF/100V	.12
.0082UF/100V	.12
.01UF/100V	.12
.015UF/100V	.12
.022UF/100V	.12
.033UF/100V	.12
.039UF/100V	.12
.047UF/100V	.14
.056UF/100V	.14
.068UF/100V	.18
.082UF/100V	.18
.1UF/100V	.18
.15UF/100V	.18
.22UF/100V	.18
.27UF/100V	.22
.33UF/100V	.30
.47UF/100V	.34
1UF/250V	.85
2.2UF/250V	1.25
3.3UF/250V	2.30
4.7UF/250V	2.80
6.8UF250V	4.40
10UF/250V	5.90

GREENCAPS HIGH VOLTAGE

.01UF/630V	.22
.022UF/630V	.24
.033UF/630V	.26
.047UF/630V	.30
.1UF/630V	.38
.22UF/630V	.45
.33UF/630V	.46
.47UF/630V	.50

CERAMIC

1PF	.08
1.5PF	.08
2.2PF	.08
2.7PF	.08
3.3PF	.08
3.9PF	.08
4.7PF	.08
5.6PF	.08
6.8PF	.08
8.2PF	.08
10PF	.08
12PF	.08
15PF	.08
18PF	.08
22PF	.08
27PF	.08
33PF	.08
39PF	.08
47PF	.08
56PF	.08
68PF	.08
82PF	.08

STYROSEAL

56PF/630V	.25
68PF/630V	.25
82PF/630V	.25
100PF/630V	.25
120PF/630V	.25
150PF/630V	.25
180PF/630V	.25
220PF/630V	.25

Books and Literature . . . Continued

And at the practical level few, if any, of the surplus boards which appear to have flooded the US market (at least when this book was written) would be available in Australia.

In these circumstances unfortunately we can only say, "Not recommended".

Our review copy from Technical Book & Magazine Company Pty Ltd, 289 Swanston St, Melbourne, Vic 3000.

VCR servicing — highly commended

DOMESTIC VIDEOCASSETTE RECORDERS — A Servicing Guide. By Steve Beeching, AMIERE, T Eng (CEI), MRTS. Stiff paper covers, 120pp 244 x 188mm, illustrated by many circuits and diagrams. Published 1983 by Newnes Technical Books (Butterworths). ISBN 0 408 011033. Price in Australia $37.

While a number of books have appeared on the shelves covering the technology of videocassette recorders, most seem to have attracted comment amounting to: "useful up to a point, but . . ."

Included in the "buts" have been non-up-to-date text, undue reliance for illustration on the commercial U-Matic system, concentration on NTSC format VCRs, and superficial not-always-accurate treatment of the subject.

First published during this current year, this new book by Steve Beeching is about as up-to-date as it can be. It concentrates on the technology found in domestic VCRs, it has been written in a PAL system country for PAL system readers, and, as far as can be judged from examination and spot reading, it is the end result of thoughtful technical research. Indeed, in at least one area, which we came across, the author criticises manufacturers for presenting dubious theory in some of their own service manuals.

At first glance, the author might appear to have turned the clock back too far, by beginning his first chapter on "Systems" with an explanation of the ancient Philips N1500 VCR (it was introduced in 1972). But he points out that it established many basic principles from which subsequent systems were developed, including follow-up Philips formats, VHS, Beta and Video 2000 — all of which are discussed in detail.

The general survey of systems is followed by a short chapter on aximuth tilt (the elimination of guardbands) and a lengthy section of the FM system of recording video luminace information on video cassettes — used, with variations, in all formats. Here, as elsewhere, Steve Beeching has taken the trouble to collect and present the facts and figures that hitherto have only been available, if at all, from scattered sources.

Another long chapter explores the hitherto elusive subject of servo systems, needed to control the head drum, the capstan and, in the V-2000 system, head tracking.

This is followed by a discussion of the "colour under" system of chroma recording and playback, again with figures of bandwidth and frequency, and explanations of how various formats cope with no-guardband crosstalk. This is heavy going, through no fault of the author, but it is required reading for anyone who aspires to grasp even the basic principles.

A chapter on "Systems Control" gives an insight into the mysteries of front-panel pushbutton logic. The final chapter gives a lucid explanation of the problem of noise bars, etc, in "trick play" modes and the approaches which various manufacturers have developed to deal with the problems. Unless I missed it, only National's latest composite three-head system, as in the NV-777 VCR, has come too late for inclusion.

In his introduction, Steve Beeching says that his book is not intended to replace normal service manuals, being concerned with principles rather than the design details of individual models. But it has to be the best supportive text I have seen to date for the would-be expert in domestic videocassette recorders. Highly commended!

Our copy came from the Technical Book & Magazine Co Pty Ltd, 289-299 Swanston St, Melbourne 3000. (W.N.W.)

Practical TRS-80 interface circuits

INTERFACE PROJECTS FOR THE TRS-80 (MOD III) by Richard C. Hallgren. Published by Prentice-Hal Inc 1982. Soft covers, 152 pages, 174 x 234mm, illustrated with diagrams. ISBN 0 13 469429 5. Price $19.25.

This book covers the theory behind the connection of a computer to external devices and gives a range of circuits which can be built and put to use with the TRS-80 Model III computer. The examples given range from the simple to the complex and all, according to the author, have been built and tested.

Software both in Basic and Z80 machine language is included with each circuit, together with an explanation of the principles of operation of each device.

continued on page 144

has its moments, but they are few and far between. But there were enough of them to send me to my shelves to play again after many years the great Psalmus and the Peacock.

I have just noticed that, as a possible explanation of the resurrection of this recording, it is part of a Collector's series. (J.R.)

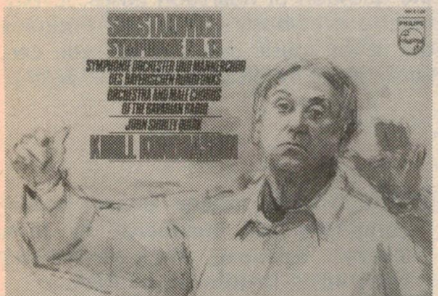
SHOSTAKOVICH No 13

SHOSTAKOVICH — Symphony No. 13. Bavarian Radio Orchestra and Male Choir with John Shirley-Quirk (bass) conducted by Kyril Kondrashin. Philips analog stereo 6514 120

Each of the five movements of this symphony has a title. That of the first is Babi-Yar.

Babi-Yar is a sensitive word, even in modern Russia, because it is used in a poem by Yevkeny Yevtushenko condemning anti-Semitism in Russia, where it has always existed. A country which had earned a reputation for nobility in contributing to the defeat of the anti-Semitic Nazis felt a bit self-conscious about the revelation of a Jewish massacre at Babi-Yar. There was also the furphy of the Jewish doctors plotting to murder Stalin under medical pretence.

I heard Yevtushenko recite his poem — in Russian — translated by two Australians sitting either side of him on



the platform at the second Adelaide Festival. He did it quite ferociously and there was no doubting his sincerity. The symphony's first performance in Russia earned such antagonism that no review of it appeared in Pravda and further performances were postponed indefinitely.

There is no doubting that Shostakovich's indignation matches that of Yevtuchenko's. In the first movement, the initial theme carries in it a world of accusation and disgust. The composer had obviously not forgotten the days of the Cossack pogroms. The soloist, English bass Shirley-Quirk too sings with a force unusual to hear in the usually gentlemanly style common to so many English singers.

Although described here as a bass Shirley-Quirk is no Russian rumbler but more of a basso cantate. Yet he manages to get much Russian vigor into his splendid reading of the vocal part which, with a good choir (Bavarian Radio) runs through the work.

The second movement is marked "Humour" but this turns out to be pretty wry and quite unlike Shostakovich's cheeky errand-boy variety.

The third movement ("At the Store") has all the composer's biting irony describing not masses of goods available for purchase but the hardness of a woman's life under Soviet conditions.

The fourth ("Fears") describes only too plainly the expectation of the midnight knock on the door.

In the Finale, Shostakovich takes as his hero against all such tyranny Galileo, who stood for Truth in defying the whole of the inquisition's threatened vengeance. "E pur si muove" they both, composer and astronomer, seem to be saying, more power to them.

The production is in every way excellent; the sound (it's a live performance) excellent analog. Altogether a thrilling experience. (J.R.)

"A FIT OF DESPAIR ABOUT LOVE!"

BERLIOZ: Symphonie Fantastique, Op. 14. Lorin Mazel and the Cleveland Orchestra. Digitally mastered stereo, Telarc DG-10076. From P.C. Stereo Pty Ltd, PO Box 272, Mount Gravatt, Qld 4122. Phone (07) 343 1612.

Over the years, I have heard quite a large number of releases in the Telarc range and, while it is unwise to rely too heavily on memory, this would have to be one of the most impressive, given Telarc's apparent preference for fullsome rather than airy sound.

Perhaps significantly, it has been included in Telarc's first batch of 15 digital masters to be transferred to compact disc and, if it is even better preserved in the process — as I imagine it will be — it should indeed prove to be a most impressive recording. In compact disc form, its number will be CD-80076, with availability about now from P.C. Stereo and selected distributors.

In his detailed jacket notes, Steven Ledbetter tells how the work first emerged in the 1820s as a "program symphony" under the title "Episode from the Life of an Artist", inspired largely by Berlioz' infatuation for the English Shakespearean actress Harriet Smithson.

Despite some unsettling gossip about her behaviour, they were ultimately married, in a union that proved miserable for them both. Reacting to the ever-changing emotional pressures, Berlioz successively modified his "Episode" until it became what he himself described as a "fit of despair about love". The full score

was published in 1845, a year after Berlioz and his wife were officially separated.

The Symphony is divided into five parts which — to use the English titles — are: I: Reveries, Passions. II: A Ball. III: Scene in the Country. IV: March to the Scaffold. V: Dream of a Witche's Sabbath.

Sections I to III might be summed up as a melancholy reverie, a waltz and a pastorale, punctuated by dark thoughts and ending in ominous rolls of distant thunder. In Part IV, the artist tries to poison himself with opium but, instead, induces a horror trance in which he imagines that he has murdered the object of his love, thereafter to suffer death on the scaffold. Part V is spiritual horror — a Sabbath celebrated by devils and witches.

It is in these last two sections that the resources of the orchestra and of the recording medium are tested to the full. And so, too, will the tracking ability of your cartridge and the power handling of your amplifier and loudspeakers.

The important thing is that the quality available from the disc is very clean, adding up to a good account of a fine musical performance, although one that does carry a price penalty! (W.N.W.)

☆ ☆ ☆

FAURE — Pavane; Pelleas et Melisande (suite); Suite Masques et Bergamasques; Fantasie for Flute. Orchestra of St. Martin-in-the-Fields conducted by Neville Marriner. Edward Bennett (solo flute). Argo Digital stereo disc ZRDL 1003.

I am afraid there is little I can tell you about this one. No information accompanied the record except for the scanty material on the back of the sleeve.

There are two suites, Pelleas et Melisande and Masques et Bergamasques, the well-known Pavane, and a Fantasie for Flute. It would have been easier to guess the nature of the components of the suites since the tempos of the various movements are stated. But Marriner's interpretations of these instruc-

gram of music re-shaped "for Today's Church".

But don't jump to the conclusion that the title is a euphemism for just another Gospel rock concert. Some of the hymns and tunes here are traditional but they have been revitalised by new arrangements plus orchestral and organ support. And they are interspersed with solo and group items, a revival style chorus number ("Give Me Joy In My Heart") and a West Indian traditional carol ("The Virgin Mary Had A Baby Boy").

It's a generous program involving 17 tracks: Blow Upon The Trumpet — Praise My Soul — Like A Mighty River Flowing — The Virgin Mary Had A Baby Boy — Christ Triumphant — Spirit Of Holiness — Give Me Joy In My Heart — As Water To The Thirsty — Christ Is Made A Sure Foundation — My Song Is Love Unknown — A Purple Robe — Downtrodden Christ — With Loving Hands — Name Of All Majesty — Father, Although I Cannot See — Come Sing The Praise Of Jesus.

Featuring the Church Orchestra and Choir under Noel Tredennick, and soloists Elisabeth Crocker and Colin Ferris, the performance is enthusiastic, although lacking polish in some areas. The sound is generally well balanced but, again, compromised on occasions by building acoustics and an "edginess" on massed voices. These aspects may perturb hifi buffs but, at a family level, they could be outvoted by others who find pleasure in a 51-minute session of contemporary praise. (W.N.W.)

The new address for World Record Club is: C/- EMI Records, 2 Parramatta Rd, Homebush 2140. Phone (03) 764 0044.

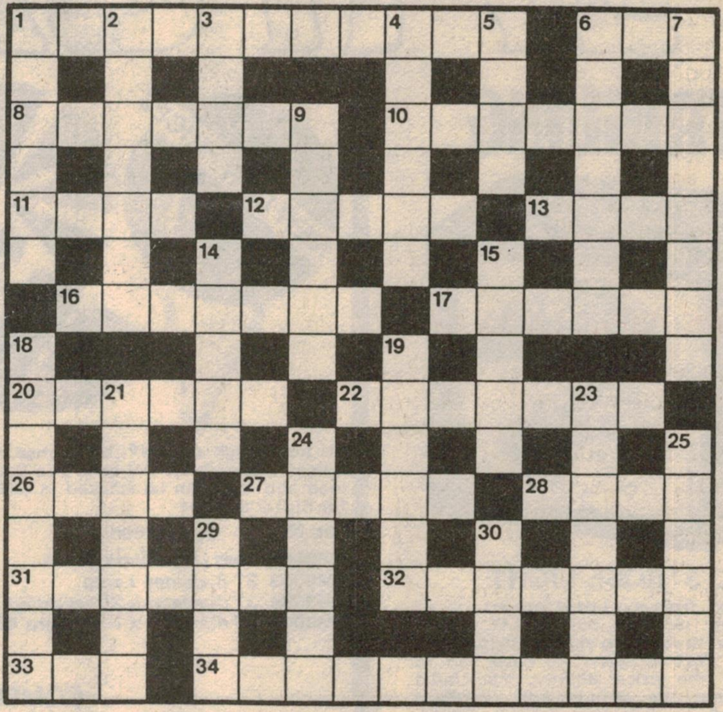
TURNED ON SWING, Larry Elgart and his Manhattan Swing Orchestra K-tel APL1 4343.

If you are a fan of the big bands of the swing era, or else wondering what your parents were always raving about, this release from K-tel should be a good sampler for you to try. The word sampler is most appropriate as there are over seventy tracks, with six subheadings: Hooked on Swing — Hooked on Big Bands — Hooked on a Star — Hooked On Astaire — Hooked on the Blues — Hooked on Broadway!

All the tracks are played by Larry Elgart and the Manhattan Swing Orchestra and have the benefit of modern recording technology thanks to RCA, New York.

Just a few of the tracks to whet your appetite: In The Mood — Opus Number One — Take The "A" Train — String Of Pearls — Frenesi — Chattanooga Choo Choo — Come Fly With Me — Chicago — Cheek To Cheek — Putting On The Ritz — Lovely To Look At — St Louis Blues — Basin St Blues — Hello Dolly — 42nd Street. (N.J.M.)

Electronics Australia
JULY CROSSWORD



ACROSS

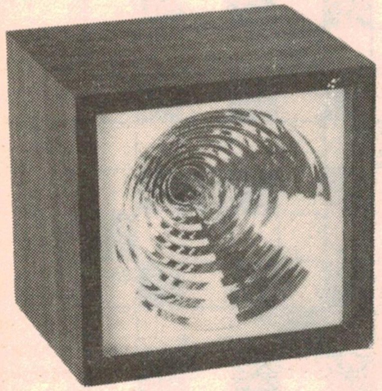
1. What this magazine is about. (11)
6. Charged particle. (3)
8. Convert AC to DC. (7)
10. Change the course of an electron beam. (7)
11. Popular records. (4)
12. Colour of an electronic box. (5)
13. Prefix denoting a factor of 10^{-18}. (4)
16. Alters setting of a control. (7)
17. Type of plug. (6)
20. Device which determines if a component is operating correctly. (6)
22. Cartridges (4-3)
26. Method used in many bridge circuits. (4)
27. Electronic inference? (5)
28. Term used for superior sound reproduction. (2-2)
31. Bright light. (3,4)
32. Stringed instruments often with electronic attachments. (7)
33. Noisy German standard. (3)
34. Substance which conducts when in solution or molten. (11)

DOWN

1. Joins to ground (6)
2. Above the ground state. (7)
3. Adjust capacitance by a small amount. (4)
4. Indirectly produce an electric or magnetic effect. (6)
5. Lacking volume. (4)
6. Property of mass. (7)
7. Brand of electronic goods found throughout Australia? (8)
9. Deflection component of an oscilloscope CRT. (1-5)
14. Device used to receive radio signals. (5)
15. Plugs and sockets. (5)
18. Quantity set as a basis of comparison. (8)
19. Conducting medium in a circuit. (6)
21. Element which is much used in electronics. (7)
23. Winding of a transformer. (7)
24. Cause two circuits to interact. (6)
25. Group of animal cells. (6)
29. Digital circuit. (4)
30. Prefix which is a million times greater than 13 across. (4)

JAYCAR

INTRIGUING

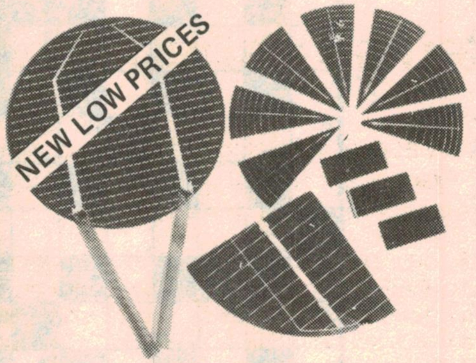


DISCO-STROBE LIGHT

A few left from our last shipment. We have received our FINAL SHIPMENT of low cost strobes. Unfortunately due to cost increases we have had to increase the price slightly. You must agree that the strobes still represent outstanding value for money. STILL almost HALF our competitors price! Remember these units are guaranteed for 3 months.

Quantities limited to 2 per customer
Cat. XM7005

ONLY $19.95



We now stock a COMPLETE range ofhigh efficiency Silicon Solar Cells. All cells give 0.45V under rated load and they can be stacked in series or in parallel for higher current.

Cat. No	Description	1-9	10+
ZM9002	Rect. 10x20mm 45mA	$2.45	$1.95
ZM9003	3" diameter 1 amp	$26.50	$22.50
ZM9004	3" diameter x 30° segment 78mA	$3.25	$2.95
ZM9005	4" diameter x ¼ segment 450mA	$12.45	$11.95

JAYCAR

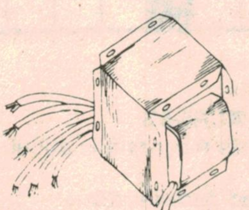
SEE THE OTHER JAYCAR ADS IN THIS MAGAZINE FOR OUR STORE ADDRESSES AND PHONE NUMBERS....

codemaster*

$9.95

WAS $12.50

Many of you know the clever parlour game that uses coloured tokens to stretch the brain to work out a hidden code in a minimum number of moves.
The people that came up with the game used a descriptive name which no-one else can use. It is a popular game and is well known under this name. Our game is similar to this game but - naturally - its electronic!! And, what's more, you can play against the machine - alone. Each XM7015 Codemaster measures 140(l)x85(w)x25(d) looks similar to a pocket calculator and runs off a standard 9V cell. Provision is made for a mains adaptor as well.
The Codemaster once sold for $29.50 but Jaycar has made a huge scoop purchase. You save a fortune!
Grab one now for only ~~$12.50~~!! $9.95
* (For a further clue to the origin of this game read this page carefully)



Cat. MM2020

COMPUTER TRANSFORMER BARGAIN

$24.50

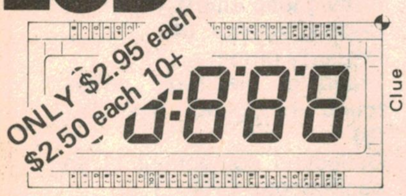
SAVE $5.00
WAS $29.50

We have secured a quantity of a power transformer at a never-to-be-repeated price. This unit is ideal as the basis of an S-100 power supply, but can be used for many other computer or general power supplies.

SPECS: Primary 240V AC – Secondary 1: 15VAC 2 amp – Secondary 2: 15VAC 2 amp – Secondary 3: 8VAC 8 amp.

A typical DC supply could be ±15V DC @ 1.5A & 5V DC @ 8 A or ±12V DC @ 2A & 5VDC @ 8A. This transformer would normally sell for around $50 – Brand new stock.

LCD



Clue
M-S-T-RM-N-D

We have done it again! Once again Jaycar has secured a quantity of valuable LCD displays. Once again we are passing them on to you at prices that will make our competition green with envy!
Basically we have a 5 digit x 18mm high (that's BIG) LCD display. But there is a snag, and here is where you save. Normally this display would sell for around $20 – if it had the connecting pins bonded to the glass substrate. But this display just has the metallization on the glass substrate. Too hard to connect you say? No, not at all!!!
We have discovered that a humble Molex pin is JUST PERFECT as a connector! You slip the Molex pin on to the edge and superglue it in place. You then have a permament connection, a great LCD display and have saved a fortune to boot! (Instructions for fitting the Molex pins as well as FULL DATA and connection diagrams on the LCD are supplied).
And what do you pay for this LCD display?
ONLY $2.95 each or $2.50 each 10 up.
Staggering value. Cat. ZM9015
Pack of 50 Molex pins (only 42 required) Cat. PI6540 Only $1.00

NEW! MICRO CHARTS

NOW ONLY $9.95 SAVE $3.00!!

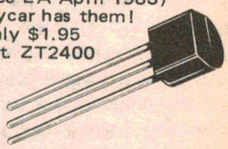
Instant Data on the Most Popular Computer and Microprocessor Parts

- Fully decoded data – no need to unscramble numbers
- Instant Access
- Compact 8½" x 11" size
- Durable credit card plastic – lasts a lifetime
- Perfect for programmers and engineers – two-sided and totally comprehensive
- Clear and concise tables for: full instruction set, disassembly, ASCII, base conversion, effect of flags, compare vs jump, interrupt structure, pinout, cycle times, diagrams, bug notes, and much more

Cat. BM8500	Z80 CPU
Cat. BM8501	8080A/8085A
Cat. BM8502	6502(65XX)

2SC2545

2SC2545. The low noise transistor for pre-amps! (See EA April 1983) Jaycar has them! Only $1.95 Cat. ZT2400

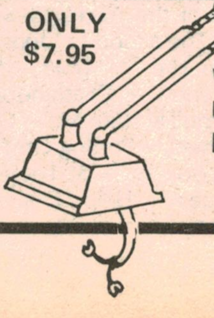


Are the "rabbit ear" antennas on the back of your portable TV broken? You know those ones that are telescopic and have ball-swivel joints.
We have genuine 'HMV' factory spares that will fit other TV's Apparently they are almost industry-standard components. Each unit comes with a short length of lug-terminated 300 ohm ribbon.
We have a small job lot available at only $7.95 each.
ONLY 220 SETS AVAILABLE.
Cat. AA2005

$7.95

ONLY $7.95

WHAT'S UP DOC?



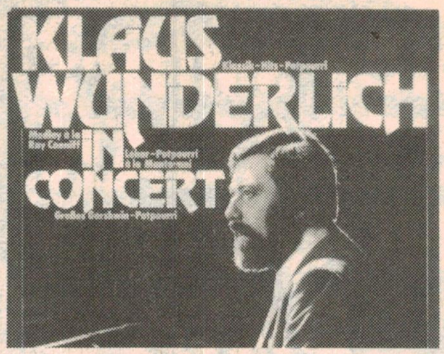
For the background themes, John Barry identified traditional Zulu music and orchestrated it into suitable form: Main Title Theme, Isandhlwana 1879 — News of the Massacre — Rorke's Drift Threatened — Wagons Over — First Zulu Appearance and Assault — Durnford's Horse Arrive and Depart — The Third Assault — Zulu's Final Appearance and Salute — The VC Roll and Men of Harlech.

On side two is a selection of six Zulu stamps played with percussion and guitars and sounding, to this non-teenage reviewer's ears, as if they could be translated straight into a disco, without the audience ever guessing that the Zulus thought of it first! (W.N.W.)

ORGAN "SPECTACULAR"

KLAUS WUNDERLICH IN CONCERT, Featuring the Wersi "Helios" electronic organ. Stereo, R-09887. Re-released through the World Record Club.

Originally released through EMI in 1980, this recording features music from Wunderlich's very successful English tour in 1979. Amongst other things, the tour demonstrated to the doubters that the organist could indeed produce the variety and multiplicity of sounds, which appeared on his studio albums, without



recourse to double-recording or other studio hocus-pocus.

This recording should therefore leave you in no doubt about Wunderlich's extreme digital dexterity, his ability to execute complete changes in sound and style without the slightest fumble, and the ability of the instrument to respond with a wide range of imitative sounds as complex as those of a full string chorus. Wunderlich and his Wersi are the stuff of which popular organ spectaculars are made. If your interests lie in that direction, you'll be delighted!

But if the recording settles one argument, it may well start another — as it did in my home. Side 1 is taken up mainly by a "Classic Hits Potpourri" — 10 fractured melodies in 16 minutes. As one member of the household put it:

"It's irksome enough having to accept 1.6-minute switches from Beethoven to Tchaikovsky to Chopin to seven others, without also having to accept electronic caricatures of the real thing. On a piano, maybe, but not an organ!

"Of course he can play well but it sounds all wrong!"

Presumably it isn't quite so inappropriate to do the same thing with Lehar (a la Mantovani) and even acceptable, on side 2, to do it to Gershwin, or to a couple of numbers "a la Ray Conniff".

So take your choice: you can wonder at Wunderlich on the Wersi, or get mad at the medleys! (W.N.W.)

PIANO THERAPY!

TRAUMEREI. The Most Beautiful Piano Classics. Deutsche Gramophon stereo 2545 003. Now released as World Record Club R-11022.

This album was first published in Germany in 1968/69 and, if memory serves me correctly, I have encountered it before in different packaging.

In no sense is it an exciting record. On the contrary, one gets the impression that the contents have been hand-picked, or deliberately played by the contributing solo pianists to be relaxed and restful. It may bore you, it may relax you or it may delight with its old-world charm.

The nine selections are: "Fur Elise" (Beethoven), "Impromptu" (Schubert), "Moment Musical" (Schubert), "Traumerei" (Schubert), "The Prophet Bird" (Schubert), "Nocturne No. 2" (Chopin), "Lieberstraum No. 3" (Liszt), "Raindrops Prelude" (Chopin), "Etude" (Chopin), Barcarolle (Chopin), "Clair de Lune" (Debussy).

Soloists contributing to the program are Wilhelm Kempff, Christoph Eschenbach, Tamas Vasary, Stefan Askenase, Geza Ande and Martha Argerich.

Despite the fact that some of the tracks date back some 15 years, the general quality of the sound is quite adequate for music that will almost certainly be used as nostalgic, relaxing background. It could fill that role very well. (W.N.W.)

HYMN SINGALONG

HYMNS FOR TODAY'S CHURCH Presented by All Souls' Choir, Orchestra and Congregation. Stereo, Word WST-9623. (From Word Records Aust, 18-26 Canterbury Rd, Heathmont, Vic 3135. Phone (03) 729 3777.

This album was produced in All Souls Church, Cheshire, England, that unforgettable town in Cheshire whose carefully preserved buildings nestle within an ancient Roman wall. The traditional setting lends emphasis to this pro-

tions are so unlike what one might expect, that no detective work is possible.

Often his reading of adagio goes almost moderato and vice versa. What I can tell you is that there is none of Maeterlinck's dark, mysterious medievalism but some light almost drawing-room pieces all written in the composer's lovely clear style. No hint of meaning anywhere except for one labelled "The Death of Melisande".

The playing everywhere is admirably sensitive and not a note of coarseness mars the score in any of the pieces. And there is also much fine flute playing (in solos) by William Bennett. Marriner conducts his group with all his usual authority and the sound is excellent. If anything, the digital technique enhances the music. (J.R.)

CHERRY PIE AUDIOPHILE

SYDNEY WIND QUINTET: Poulenc, Damase, Ibert. Audiophile digital stereo, Cherry Pie LA-07889. Released through Festival.

This particular record was the focus of an article on dynamic range in our October '82 issue, occasioned by the fact that pre-production pressings had presented tracking problems for certain audiophile type phono cartridges. It turned out to be mainly a problem of too little cartridge tracking weight, shown up by transients of rather more than usual amplitude. Then, as now, I could not identify any special difficulty.

The jacket still carries a cautionary footnote but, provided you have a reasonably good phono deck, adjusted to maker's specifications, you should not strike any problems.

This official release, in a beautifully presented and sealed jacket has been produced from the same master disc but has had the benefit of production to full audiophile standards in that part of Festival's Sydney plant set aside for that purpose. Festival are taking the audiophile business very seriously these days and this album, along with others in the pipeline, is scheduled for world release.

The Sydney Wind Quintet is the Quintet-in-Residence at the NSW State Conservatorium of Music. It comprises Michael Scott – flute; Josef Hanic – oboe; Gabor Reeves – clarinet; Gordon Skinner – bassoon; Arthur Buddle – French horn. Associate artist is Elizabeth Powell – piano.

Members of the Quintet, born in Europe, New Zealand and Australia, have each been orchestral musicians and solo artists in their own right but they combine superbly in a group which has toured for Musica Viva and broadcast extensively for the Australian Broadcasting Commission.

Presented here are: "17 Variations for Wind Quintet" – Jean-Michael Damase; "Cinq Pieces en Trio" – Jacques Ibert; "Sextet for Wind Quintet and Piano" – Francis Poulenc. Each item is covered in well written notes by Richard Toop.

Toop points out that, true to the inclinations of the French school, the compositions tend to contrast rather than to blend the instruments. The skill of the players, the acoustics of the Sydney Opera House Recording Hall, and the definition of the digital master recording help bring the individual instruments further into clear focus.

I am told, in fact, that the album is finding a supplementary role as a demonstration disc in hifi salons when the question of definition arises. It may not be everybody's choice of program but, if the music does appeal, you certainly won't be disappointed. (W.N.W.)

COLONIAL HISTORY

ZULU. Original motion picture score, composed and conducted by John Barry. Stereo, Powderworks POW-4012. Distributed by RCA.

Although this particular recording is dated 1982, the film to which the music belongs was premiered in London on January 22, 1964. Directed by Cy Endfield, it starred Stanley Baker, Jack Hawkins, Ulla Jacobsson and James Booth, to which must be added "and introducing Michael Caine". It was released through Paramount.

Aspiring to be a blockbuster, the film sought to recreate a piece of British colonial history when in January 1879, a force of British Redcoats was decimated by two Zulu Divisions, losing 1500 men. But, at Rorke's Drift, a small contingent of the 24th Foot Regiment fought their way into history with a subsequent defensive action that won them 11 VCs.

Filmed on location in Natal, quite close to the battle site, "Zulu" featured people of the same race, brought from their reservations and trained to re-enact the original scenes.

REVIEWS OF RECENT

Records & Tapes

CLASSICAL • POPULAR • SPECIAL INTEREST

SONGS OF THE AUVERGNE — "Delicious trifles"

Canteloube — 18 Songs of the Auvergne. Frederica von Stade (soprano) with the Royal Philharmonic Orchestra conducted by Antonio de Almeida. CBS Masterworks Digital Disc D37299

This disc is full of delights — if you are prepared to compromise with Ms von Stade on the matter of some of her unusually slow tempos. These, I imagine, since the series was long contemplated, were the result of much thought.

The result, I suggest, was due to temperament, not Ms von Stade's, but that of the Auvergnats'. These denizens of the Auvergne as they are known are for the most part disliked, or at any rate disparaged, by a great many of their fellow French. They inhabit one of the least attractive regions of France, a place of rugged rocky landscapes, the cones of extinct volcanoes, and villages — many with dirty little streets!

Many French claim the Auvergnats are dour, crafty folk (Pierre Laval was an Auvergnat) although the only one I ever got to know well was a very likeable fellow.

Nor is the gastronome likely to be pleased with what he finds there except the famous Cantal cheese and the not-so-famous Blue d'Auvergne, a real rival to the better known Roquefort.

The average Auvergnat does not, as a rule, perform as does the sprightly Spanish de los Engeles, who has recorded these songs, or passionately as Madeleine Grey, who has also done them.

And I think this was Ms von Stade's ruling consideration: to keep within the Auvergnat temperament. Fanciful? Perhaps. But it's as good an interpretation of the phenomenon as any I can think of.

The 18 songs featured on this issue (Vol. 1) cover almost every conceivable mood, each caught to perfection by the beautifully fresh-voiced Frederica von Stade, who, despite her name, is neither French nor German but American. Nor

will an expert knowledge of French give you a clue of what she is singing about.

She sings them in their original Langue d'Oc, an ancient form of French dialect, curiously pronounced and mixed with early Celtic and Roman. Mercifully, a translation accompanies the disc. These folksongs were collected by Marie-Joseph towards the end of the last and beginning of the present century — a great time for collectors of these strangely spontaneous creations before they disappeared. I refer to the songs not the collectors!

Our own Percy Grainger was one of the most enthusiastic collectors and is alleged to have stopped a farmer in the middle of his ploughing to sing while Grainger made rapid notes of the tune. He foung Brigg Fair in this way and handed it on to his friend, Delius. This was in Norfolk.

Canteloube scored the accompaniments with gorgeous sound. Some might think them over-sophisticated at times. This is as it might be but it didn't affect my enjoyment of these delicious trifles. The scented sound delivered by the Royal Philharmonic Orchestra under Antonio de Almeida I found unfailingly enchanting. To suit this material, Ms von Stade uses her lovely voice in an artistic but difficult-to-describe blend of sophistication and innocence. (J.R.)

KODALY: "No delights in these works"

KODALY — Summer Evening. Concerto for Orchestra. The Budapest Philharmonic Orchestra conducted by Zoltan Kodaly. DGG stereo disc 2543 809.

I must confess to wondering why DGG revived a disc, recorded back in 1960, of some of Kodaly's less interesting music. True, the stereo sound of the time is goodish by most standards, slightly coarse in fortissimo passages and a bit confused in loud tuttis while disappearing into silence if the fortissimos are made endurable.

As a rule, Kodaly's music both interests and charms me but I found no delights in either of these works, the early composition "Summer Evening" or the fully mature concerto written some 30 years later. The first is pedestrian (I am allowing for the composer's youth) and the latter only a little better.

Neither is a patch on the better known "Psalmus Hungaricus" or the "Peacock Variations", both of them masterpieces and unmistakeably Hungarian, much more so than the works under review. Strange this, because "Summer Evening" was composed at the height of Kodaly's enthusiasm for collecting Hungarian folksongs, an enthusiasm he shared with his friend Barto who considered him the most Hungarian of all composers of that nationality.

By the way, I might as well take this opportunity to explain to those unaware of the fact that music of the Rhapsody type is Gypsy and not truly Hungarian.

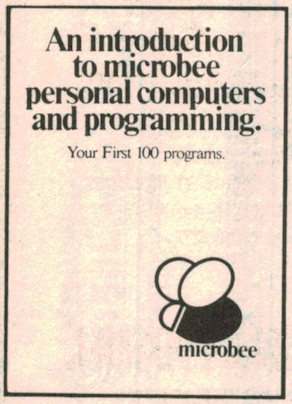
Thinking that I might have been in an unreceptive mood the first day I played the disc, I listened to it again some days later. Same result!

Moreover Kodaly seems to conduct the manifestly competent Budapest Philharmonic Orchestra in a mood very close to the lackadaisical. Not to condemn it too viciously, I think it fair that it

Reviews in this section are by Julian Russell (J.R.), Neville Williams (W.N.W.), Leo Simpson (L.D.S.), Norman Marks (N.J.M.), Greg Swain (G.S.), and Danny Hooper (D.H.).

Books & Literature

The Microbee computer — beginner's guide



AN INTRODUCTION TO MICROBEE PERSONAL COMPUTERS AND PROGRAMMING: Published by Honeysoft Publishing Company, Waitara, NSW 1983. Soft covers, 210 x 298mm, 50 pages. $14.95.

This thin book, subtitled "Your first 100 programs" is an introduction to the Microbee computer written by two Australian school teachers and intended "for people who have never had their hands on a computer before". In 50 rather tight-packed pages it covers the Microbee from setting up to advanced graphics procedures, aided by sample programs and extensive diagrams.

Topics covered in the book include the use of the PRINT statement and punctuation, the edit mode, programming style and presentation, program structure, constants, variables and arrays, and mathematical operations.

Both high resolution and low resolution graphics are discussed in detail, again with extensive examples and programs illustrating the use of the programmable character generator.

Music is also well covered, and a brief explanation of all Basic statements and commands is included. Worksheets for defining programmable characters and formatting screen displays are included towards the end of the book, with a glossary.

While we didn't count them, there appear to be at least 100 program listings in the book, most of them short examples on one or another feature of the Microbee computer. Larger programs are provided to cover financial planning, appointments scheduling and filing, among other topics.

This book will be of interest to all users of the Microbee computer. Our review copy from the publishers. The amount of information provided on the Microbee and Microworld Basic makes it worthwhile reading. (P.V.)

Microbee manual — updated version

USER'S MANUAL: MICROWORLD 16K BASIC: Published by Honeysoft Publishing Company, Waitara, NSW 1983. Soft covers, 152 x 210mm, 157 pages. $14.95.

This is not the usual type of publication reviewed in these pages but rather a revised and re-written version of the User's Manual for the Applied Technology Microbee computer, published by Honeysoft, the publishing subsidiary of Applied Technology Pty Ltd. We do not normally review user's manuals, but Applied Technology sought our comments following criticism of the original manual in our review of the Microbee computer.

The new manual is well presented and laid out and incorporates all the suggestions, comments and corrections that have been received from users over the past six months. With that sort of feedback it should now be thoroughly debugged. The manual is divided into eight sections.

Section one is an introduction to the Microbee, with sub-sections covering setting up the system and an explanation of terms used in the manual. Section two is a broad overview of Microworld Basic, explaining in simple language the uses of variables, constants and expressions, the process of entering a program and use of the Microbee in the immediate mode.

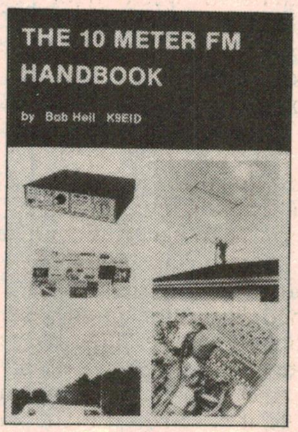
A tutorial introduction to Microworld Basic is found in Section three, covering line numbering, saving and loading programs, program editing, music, graphics, string functions and error trapping. Section four begins programming, with a complete discussion of the many Basic statements, mathematical and string operations, loops and subroutines and graphics and input/output operations.

The most extensive part of the manual is Section five which contains descriptions and examples of all statements and commands used by Microworld Basic. Section six rounds out the manual with a selection of applications programs and instructions for converting programs in other versions of Basic to the Microworld format.

A glossary and appendices covering ASCII and hexadecimal codes, ROM memory locations, I/O ports and the Microbee Basic token codes completes the manual.

All in all this new user's manual is certain to meet the criticisms levelled against the original publication. It has been re-written with the beginner in mind with extensive examples and a step by step guide to getting the Microbee up and running. It is the ideal complement to the versatile and friendly Microbee computer. (P.V.)

10 metre FM — but not in Australia

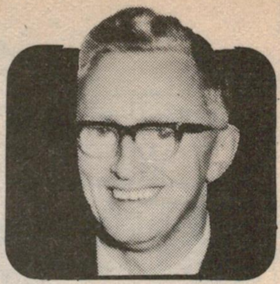


THE 10 METER FM HANDBOOK by Bob Heil (K9EID). Published 1980 by Melco Publishing, Illinois, USA. Soft covers, 80 pages, 150 x 228mm. Illustrated with circuits and photographs. Price, $7.10.

This book deals with the amateur 10-metre FM scene in the United States and Canada and, in large part, the construction and use of 10-metre repeaters, and even 2-metre to 10-metre repeaters. At the practical level, most of the constructional material is based on commercial and surplus equipment and its modification for use with these activities.

As such it would seem to have very little value for Australian amateurs. There are no 10-metre repeaters in Australia and there would appear to be no provision in the regulations for them. in fact one section (4.13) indicates that there is no intention that repeaters are to be used for long distance operation. In regard to the 2 metre/10 metre concept, there is a regulation (6.56) which specifically forbids relays of this kind.

Shortwave Scene



by Arthur Cushen, MBE

Radio France International expansion program

The introduction of a second daily broadcast in English and confirmation of expansion plans for Radio France International, including the establishment of relay bases, was announced in Paris recently.

Radio France International broadcasts in English to Africa at 1600UTC, subject to the observance of Daylight Time in France. Paris has now commenced a new English service for East Africa and the Indian Ocean area for their morning reception, and this broadcast can be heard here between 0415-0430 and 0445-0500UTC. Two other 15 minute broadcasts in French can be heard at 0400 and 0430. Reception is best on 7135kHz while 9795, 11735, 11875 and 15155kHz also carry the broadcast. Paris is heard after this time on the same frequencies in French.

Radio France International recently introduced broadcasts in Spanish and Portuguese to South America, while plans have been announced for the introduction of a Russian transmission later this year and next year some African languages will be added to the schedule. A service to Asia is anticipated to be operating by 1985, while relay bases are being planned, including one in French Guyana which should be operational by the end of the year. RFI is making use of the Africa No. 1 transmitters at Moyabi in Gabon, and is having discussion with Deutsche Welle about the possibilities of using time on their relay base in Sri Lanka when it is completed. According to an RFI spokesman the French Government realised that they did not have a good service in the Pacific area and felt that French political views were not well known, so talks are underway concerning the establishment of a relay base in New Caledonia.

NEW FREQUENCIES

NORWAY: Radio Norway is heard best in two transmissions in this area, at 0700 and 2000UTC. The first broadcast is on 6015, 9590, 21730 and 25615kHz and the second transmission on 9590, 15165, 15175, and 17840kHz. All transmissions are in Norwegian except that on Sunday the first 30 minutes of the 0700UTC transmission is in English.

AUSTRIA: From May 1 the Austrian Radio is using its new 500kW transmitter for all transmissions, broadcasting to Australia at 0700-0900UTC on 15270kHz and 17740kHz. English is carried 0830-0900UTC.

A second transmission at 1000-1200UTC is on 15415 and 17810kHz. Further English broadcasts are 0330-0400 on 5945 and 9770kHz; 0430-0500 on 11665 and 15165kHz and 1830-1900 on 6155, 15440, 15560 and 17770kHz.

CZECHOSLOVAKIA: Prague is continuing to test on new frequencies and after using 6015 has been heard on 11800kHz with English 0300-0357UTC. This frequency is on a test basis and the station announces only 5930, 7345, 9540, 9630, 9740, 11950 and 11990kHz.

TURKEY: Ankara has introduced an English transmission to North America 0300-0400UTC on 11740 and 17760kHz. The broadcast to Europe 2000-2100UTC is on 7155, and at 2200-2300 transmission covers Europe, Africa and North America on 9610, 9660, 11740 and 17760kHz.

SOUTH PACIFIC CHAMPION

The first contest organised by the South Pacific Association of Radio Clubs resulted in Wally Singleton of Dunedin, NZ being awarded the Championship Cup for confirming most areas in the South Pacific on medium wave. He verified all the Australian call sign districts as well as those in New Zealand, and 12 countries in the South Pacific; American Samoa, Wallis Island, Tuvalu, Fiji, Western Samoa, Vanuatu, Tonga, Cook Islands, Tahiti, Norfolk Island, New Caledonia and Solomon Islands, scoring a total of 23 points. Second place went to Chris Martin, Sydney, NSW who scored 15 points and Tony Magon of Invercargill NZ, scored 12 points. The competition was organised by SPARC which has five affiliated clubs – Southern Cross DX Club, Adelaide; DX Australia Melbourne; Down Under DX Circle, Melbourne; NZ DX Radio Association, Dunedin and NZ Radio DX League, Invercargill. The Association has been organised to promote radio listening in the South Pacific.

AMERICAN SIGNALS

CANADA: Radio CKFX Vancouver 6080kHz using only 10 watts is again being heard around 0830UTC with Country and Western music. Another Vancouver station CKZU operated by Canadian Broadcasting Corporation is now being heard on 6160kHz closing at 0805UTC now that North America is on Daylight Time. On 6160kHz also, CKZN, St John's, Newfoundland opens at 0830UTC with news and weather details.

PERU: Signals in the 60 metre band are peaking, and many heard closing at 0500UTC including Radio San Martin 4810, Radio del Pacifico 4975 and Radio Rioja 5045kHz. A new signal in our afternoons noted on 6188kHz has been identified as Radio Oriente, closing on this frequency of 6188kHz at 0400UTC. Radio Huancayo on 5950kHz has been heard to past 0700 on occasions.

Notes from readers should be sent to Arthur Cushen, 212 Earn Street, Invercargill NZ. All times are UTC (GMT). Add eight hours for WAST, 10 hours for EAST and 12 hours for NZT.

ALL KITS LESS 10%. OFFER ENDS JULY 31, 1983

ROD IRVING ELECTRONICS IS YOUR No. 1 KIT SUPPLIER

*(Offer does not extend to July 1983 Electronics Australia Kits)

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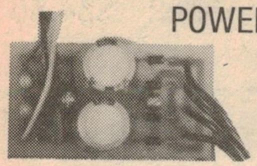

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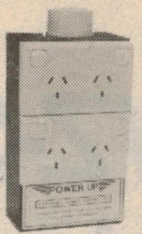

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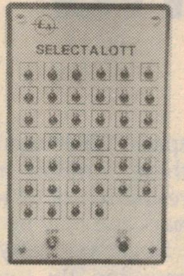

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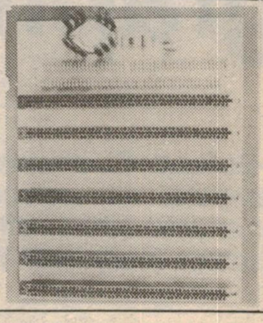

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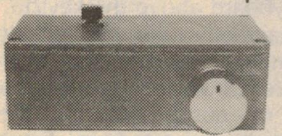

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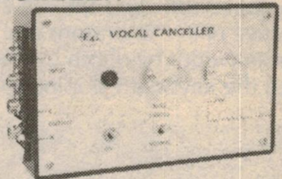

Ever wondered how your voice substituted for your favourite vocalists would sound, well now its possible! You can cancel out the lead vocal on almost any stereo record and substitute your own voice or musical instrument. EA April 82

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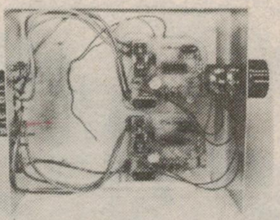
ETI 455 March 80



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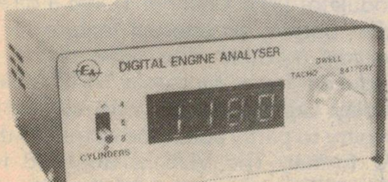

EA August 80

DIGITAL CAPACITANCE METER

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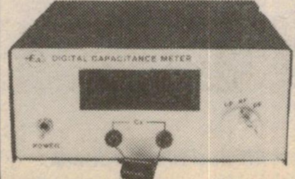

Here is an inexpensive Digital Capacitance Meter which measures from 1pF to 99.99uF in just three ranges. It's simple to use and features a big bright four-digit display with automatic updating and decimal points. EA March 80

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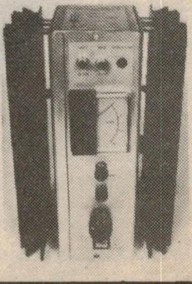

'ith this unit you can test power supplies at currents up to 15 Amps and Voltages up to 60 Volts. It can "sink" up to 200 Watts on a static test and you can modulate the load to perform dynamic tests. ETI 147 October 80

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The VZ-200: colour graphics and sound

Dick Smith Electronics has done it again with the new VZ-200, a computer with colour graphics, sound effects and built-in Basic for around $200. Others have raved about it, but what's the new machine really like? What does it offer and how easy is it to use?

by PETER VERNON

The VZ-200 computer from Dick Smith Electronics has set a new low price for a colour computer system with Basic. Indeed we can now talk about a class of "under $200" computers, and in this category the VZ-200 is a clear leader. It is the only system for the price that offers colour, a reasonable amount of memory and a powerful built-in Basic interpreter.

With its white case and brown keyboard surround the VZ-200 is an attractive unit. Dimensions are 288 x 162 x 50mm (width by depth by height at rear) with the keyboard sloping to a height of 20mm at the front. There are 45 moving rubber keys but no space-bar as such. A double-sized key at the right side of the keyboard does duty as a space key. All the keys produce an unobtrusive beep, and most serve four different functions.

Pressing a key by itself will produce the character marked on the centre of the key top. Pressing a key in conjunction with "Shift" will produce the punctuation or graphic symbol marked in the upper corner of each key. There are 15 graphic symbols, each a combination of blocks one-quarter the size of a character space. When used with POKE or PRINT@, these symbols allow graphics with a resolution of 64 x 32 pixels in eight colours and may be freely mixed with text.

The VZ-200 computer. The keyboard has 45 moving keys with audible feedback.

Single key entry of Basic statements is activated by the CTRL (Control) key. Pressing a key in conjunction with CTRL will produce the operation labelled on the keyboard above the keytop. Operations handled in this way include cursor movement, insertion and deletion of characters, inverse video and single key entry of about half of the Basic statements and functions. Entering the Basic statements marked below the keys requires holding down the CTRL key and pressing RETURN then the key required.

Although the single key entry of Basic keywords is an advantage, it does require learning key locations and a new typing style which some people might prefer to avoid. An advantage of the VZ-200 is that single key entry, while available, is not obligatory. Statements can also be typed in the normal way, and this may prove faster for a touch-typist. It's nice to have the choice.

All of the keys have an auto-repeat facility, and although it was not mentioned in our preliminary copy of the VZ-200 manual the Basic interpreter supports full-screen editing. Once listed, program lines can be altered by moving the cursor to the position of the alterations and re-typing. When the RETURN key is pressed the alterations will be incorporated in the program. When line numbers are changed in this way the result is a copy of the existing line with the new line number. The old line remains in memory.

The video display

The VZ-200 includes both an RF modulator (VHF Channel 1) and a direct video output, an unusual feature for a low-cost machine. The video display is produced by a Motorola 6847 Video Display Generator chip with additional circuitry to partly adapt the output to the PAL format. The VDG is designed for 60Hz NTSC operation, and the conver-

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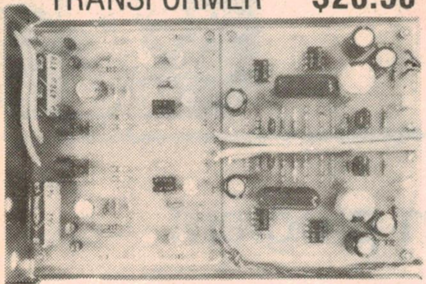

Easy construction and versatile operation, this Preamp was for coupling with the 300W "Brute" Power Amp. **ETI 467 July 80**

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EA October 81

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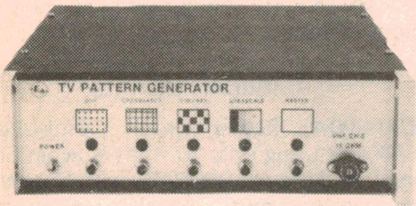

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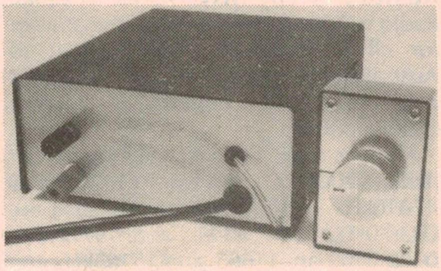

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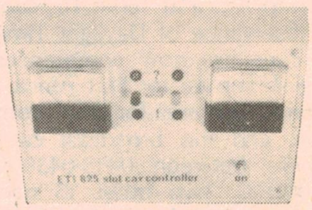

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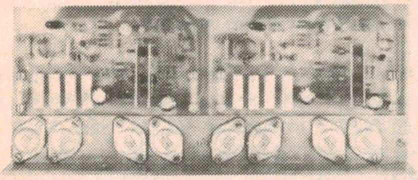

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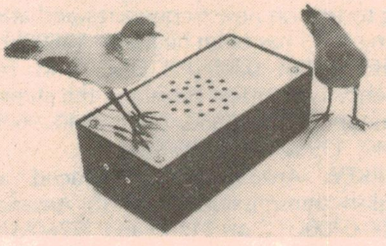

Granny's Birthday – PC Birdies.
Grannys got a birthday coming up and you don't know what to give her! Her cat ran away, her dog starved and the fish turned upside down. Well here's the perfect gift. A no-nonsense, no maintenance companion. The PC Birdies — She'll whistle, sing and dance for hours to this amazing electronic canary. **EA May 81**

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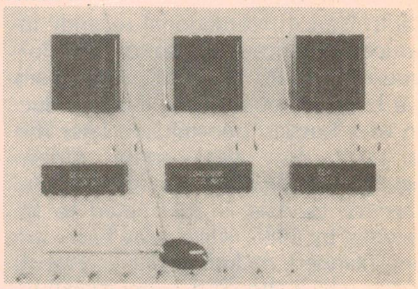

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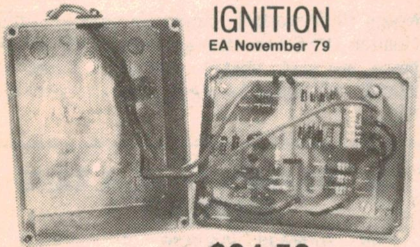

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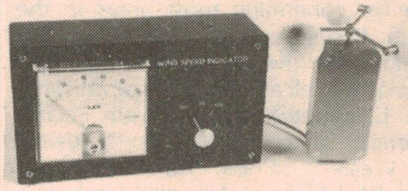
October 81



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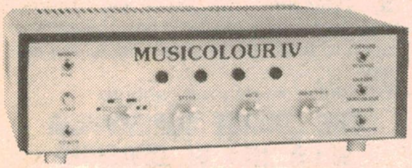

Add excitement to parties, card nights and discos with EAs new Musicolor IV light show. This is the latest in the famous line of Musicolors and it offers features such as four channel "Color Organ" plus four channel light chaser, front panel LED display, internal microphone, single sensitivity control plus opto-coupled switching for increased safety. **EA August 81**

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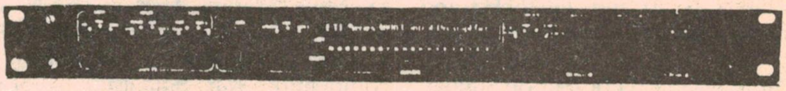


Power Amp	$299.00
Pre Amp	$259.00

KITS — KITS — KITS — KITS — KITS — KITS — KITS — KITS — KITS — KITS — KITS — KITS

sion circuitry does not fully eliminate a 10Hz ripple on the screen, even when using a direct entry video monitor.

In the text mode the characters displayed by the 6847 are stable but the sides of the text area show a distracting rippling movement. In the graphics mode the ripple shows up as sideways colour jitter and is most obvious when dots of different colours are displayed in close proximity. This display jitter prevents the VZ-200 achieving the full potential provided by its colour graphics capability.

The VZ-200 has two display formats, selected by the MODE statement. In MODE(0) uppercase text only is displayed in 16 lines of 32 characters each, with 64 x 32 block graphics available in eight colours. The normal text display is in light green on a dark green background, but a single Basic statement selects an alternative colour set, producing orange characters on a red background. An Inverse function on the keyboard allows these colours to be transposed to display dark characters on a light background in either colour set.

The statement MODE (1) activates a graphics format which allows plotting on the screen with a resolution of 128 x 64 in one of two sets of four colours each. The COLOR statement selects one of two background colours, green or buff. On a green background the colours available are green, yellow, blue and red, and on a buff background the possible colours are buff, cyan, magenta and orange. Text cannot be displayed in this mode.

Text screens are displayed with a black border surrounding a rectangle of the background colour. On a 34cm (diagonal) video monitor the text display is confined to a rectangle measuring approximately 26cm diagonally in the centre of the screen. MODE(1) graphics are similarly confined by a border, but since the border is in this case the same colour as the background the effect is less noticeable.

The character set of the VZ-200 is contained in the on-chip Read Only Memory of the 6847 Video Display Generator, and does not conform to the widely used ASCII code. Using the same character code with POKE and with PRINT CHR$ will display two different characters on the screen. Presumably software translates between the 6847 codes and ASCII, as statements such as LPRINT and LLIST do work correctly with standard printers.

The Tandy TRS-80 Color Computer also uses the 6847 VDG (although with more extensive modifications for use with PAL displays) and for this reason the text displays of the two machines are similar. Although the 6847 can produce graphics displays in 14 different formats, including 256 x 192 high resolution modes, these facilities are not used by the VZ-200. Most of the VDG control pins are tied to ground in the VZ-200 and there is insufficient memory to support the additional graphics – both situations which could be corrected by adventurous hobbyists.

VZ-200 Basic

Statements and functions of the Basic language of the VZ-200 are shown in Table 1. Numeric operations are accurate within the range 10^{38} to 10^{-38} and with the 3.58MHz clock speed of the computer, the interpreter is quite fast. All standard Basic operations are supported, including string handling in the Microsoft format (using RIGHT$, LEFT$ and MID$). A USR statement is included for calling machine language routines from Basic but the VZ-200 does not include a machine language monitor.

In the interests of economical use of memory the VZ-200 restricts the number of subroutines and FOR . . . NEXT loops which can be nested. (A loop is said to be "nested" if it occurs inside another loop, and similarly, nested subroutines are subroutines which are called from within another subroutine.) No more than 30 levels of nesting are permitted in programs for the VZ-200, but this will be found adequate for most applications.

Graphics are handled by the statements COLOR, MODE, SET, RESET and POINT. The statement COLOR I, J will set the characters to the colour represented here by code "I" while in MODE(0) the value of J selects a background/text colour combination, for

VZ-200 Specifications

Processor: Z80A running at 3.8MHz clock speed.
ROM: 16K.
RAM: 8K expandable to 24K with optional cartridge, less 2K for video.
Interfaces: Cassette interface, RF modulator and direct video connectors, I/O connector, expansion connector with full Z80 bus. Optional Centronics type printer interface.
Keyboard: 45 rubber moving keys, most with four functions.
Display: 32 x 16 lines text, 64 x 32 graphics in eight colours, 128 x 64 graphics in two sets of four colours. Inverse video.
Sound: Single voice with 31 frequencies, nine durations.
Software: Basic in EPROM, applications programs on cassette.
Documentation: New documentation under preparation at time of review.

either a green or an orange background. In MODE(1) the COLOR statement selects one of two possible colour sets, each of four colours, for 128 x 64 resolution graphics.

The statements SET, RESET and POINT are available only in MODE(1). SET and RESET as the names imply turn points on the screen on and off while POINT will return the colour code of a specified point. All three statements require arguments in the form of a pair of cartesian coordinates with the origin of the coordinate system at the upper left corner of the screen. There are no statements for drawing lines or other shapes or for filling areas on the screen with colour.

Sound is produced by software toggling of two bits of an output port driving a piezo-electric transducer in the keyboard unit. Thirty-one different frequencies can be specified, in one of nine durations, with the SOUND statement. The sound is not loud, there is no volume control, and the fixed durations and frequencies limit the sound effects which can be produced. As with colour graphics, however, the VZ-200 scores over its similarly priced rivals which offer no sound effect capabilities at all.

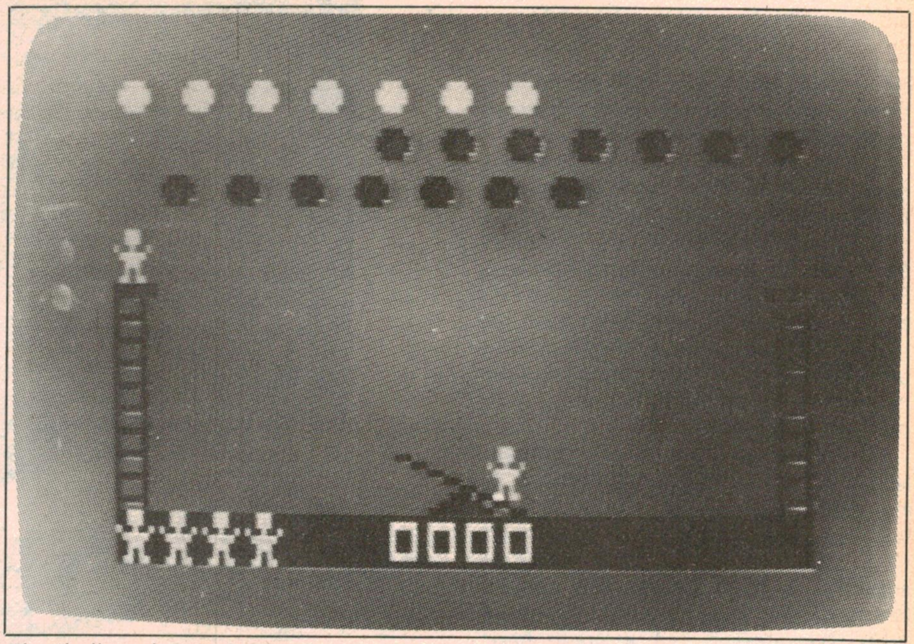
A statement which will be unfamiliar to most is the CRUN command. CRUN, a combination of CLOAD and RUN, allows a program to be loaded from cassette tape and run automatically with a single statement. It is used extensively by the programs on the demonstration tape which accompanies all VZ-200 units.

The cassette handling statements of the VZ-200 also include the familiar CLOAD and CSAVE. Program names can be up to 16 characters long, with the name of each program displayed on the screen as it is found on the tape. The VERIFY statement can be used to compare a program in memory with a program recorded on tape as a convenient assurance of a correct CSAVE, and PRINT# and INPUT# are available for recording and reading lists of data items from tape. We have no information on cassette loading and saving speed but it appears to be around 600 baud.

A COPY statement is also included in the Basic interpreter. According to the manual this statement will copy the contents of the screen to an attached GP-100 dot matrix printer. We could not test this function without the appropriate printer.

Peripherals and expansion

The cassette connection at the rear of the keyboard unit is a stereo socket and the supplied cable terminates in two



The "balloon burster" game in progress. Four colour graphics makes for eye-catching games. Over 30 programs are available on cassette for the VZ-200.

jacks, one for each for the EAR and MIC connections of a standard audio cassette recorder. There is no motor control of the cassette player.

At first we had great difficulty in using the VZ-200 with pre-recorded program tapes. Reading tapes we had recorded ourselves was only a problem until we found the correct setting of the cassette recorder volume control.

Using a more expensive National Panasonic RQ-2133 cassette recorder (Dick Smith Electronics, $82.50) however, these problems disappeared and we were able to load all program tapes.

A 16K RAM expansion pack for the VZ-200 is already on the market. This unit plugs into the expansion port at the rear of the machine to provide a total of 24K of user memory at an additional cost of $79.

A Centronics parallel printer interface adapter is also available for the VZ-200. This small unit plugs into the peripheral port at the rear of the keyboard and provides a cable terminated in a standard Centronics type connector. While the Basic COPY statement can only be used effectively with the Seiko GP-100 printer, the LLIST and LPRINT statements will produce text output on any compatible printer.

From the hobbyist's point of view a strong feature of the VZ-200 is the expansion ports provided at the rear of the keyboard. These ports consist of two sets of PCB fingers, normally covered by thin screw-down aluminium plates. One port is labelled "peripheral", and provides access to the Z80 data bus, the lower eight address lines and RD, WR and IORQ control lines, sufficient for the connection of most peripheral controllers, parallel and serial ports etc.

A second port gives access to the complete bus of the Z80 microprocessor and can be used to connect additional memory or memory-mapped peripheral devices.

Some notes on applications

Dick Smith Pty Ltd provided us with a list of around 30 applications programs currently available for the VZ-200. While some of the available games programs

Table 1: VZ-200 Basic statements and functions

ABS, AND, ASC, ATN, CHR$, CLOAD, CLS, COLOR, CONT, COPY, COS, CRUN, CSAVE, DATA, DIM, END, EXP, FOR . . . TO . . . NEXT, GOSUB, GOTO, IF . . . THEN. IF . . . THEN . . . ELSE, INKEY$, INP, INPUT, INT, LEFT$, LEN, LET, LIST, LOG, LLIST, LPRINT, MODE, MID$, NEW, NOT, OR, OUT, PEEK, POKE, POINT, PRINT, PRINT USING, READ, RESET, RESTORE, RETURN, RND, RUN, SET, SGN, SOUND, SIN, SQR, STEP, STOP, STR$, TAB, TAN, USR

The VZ-200 computer

make excellent use of the graphics capabilities and are written in machine language for speed, many of the others can be found in any good book on Basic, without the expense of buying a cassette version.

We also question the choice of some of the programs available. For example, one cassette is a "Portfolio management" program for keeping track of sharemarket transactions. It is unlikely that anyone with sharemarket investments will skimp by buying the VZ-200 to look after them. The two statistics packages might be in the same category – if you want a computer for statistical analysis the VZ-200 is an unlikely choice. If on the other hand you get some statistics problems assigned as homework these two cassettes might be handy to have.

The programs listed in the "Basic Applications" booklet which accompanies the VZ-200 are of the familiar type; sum and average, roots of a quadratic equation, conversion between degrees Celsius and Fahrenheit etc. They serve more as demonstrations of what can be done with Basic on the VZ-200 rather than as serious suggestions for the use of a computer. As such they are a useful tutorial, although most of the programs can be found in existing textbooks. In most cases nothing need be changed to run textbook examples on the VZ-200.

Graphics statements can be added in to take advantage of this aspect of the VZ-200 without difficulty.

Additional programs are under preparation at the time of this review and we expect that independent program suppliers will get into the act as soon as the VZ-200 proves its popularity. Judging from what we have found and the comments of others who have used the computer, this shouldn't be long.

About that keyboard

The most controversial aspect of the key VZ-200, and the one that we found least desirable, is the keyboard. We still can't decide whether it is better or worse than a flat plastic membrane keyboard.

It's not that the keyboard is bad in itself. It's small but the rubber keys move with a pleasant, positive action, and the audible feedback is a great convenience. The problem is that the keys also wobble sideways and back and forward, creating an unsettling effect and, we believe, markedly increasing the chances of typing errors.

Fortunately the single key entry of Basic keywords limits the need for accurate typing, and no one is likely to use the VZ-200 for applications requiring entry to large amounts of text.

We suspect nevertheless that one of the first "add-on" projects for the system will be a full-sized keyboard.

In conclusion

If you want a computer to look after your share holdings, or for word processing, look elsewhere. If, on the other hand, you want a computer for playing games, for self-education, for learning about Basic and perhaps for writing your own programs, the VZ-200 has one overwhelming advantage – the number of features for the price.

If you're handy with a soldering iron and want a computer for taking apart, adding on to and building up, the VZ-200 is also an ideal choice, for the same reason.

The VZ-200 is available from Dick Smith Electronics stores nationwide.

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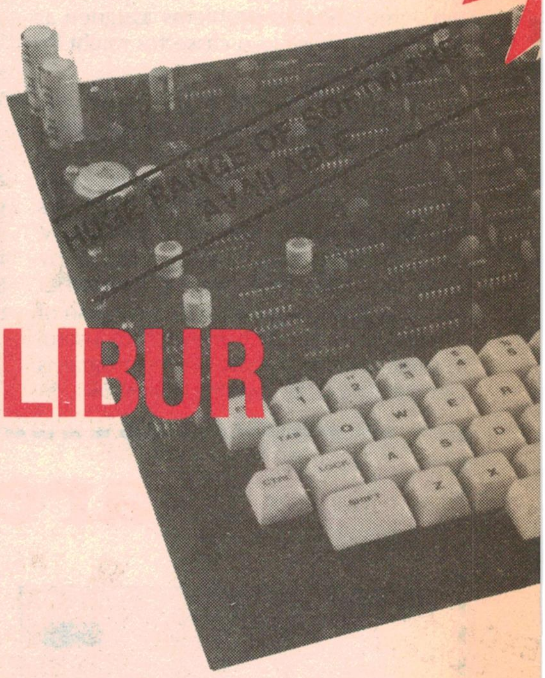

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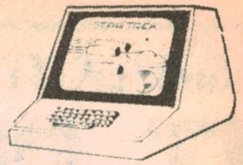
Microcomputer News



News from the Data '83 exhibition

The DATA '83 business computer exhibition and seminar series was held at Sydney's Centrepoint from May 17-19 this year. Occupying four levels of the convention centre, with over 100 exhibitors, the exhibition was well attended, although not overcrowded.

Graphics Directions Pty Ltd, who organised the show estimate that over 20,000 business people attended, based on the number of buyer's guides distributed. This figure represents interested potential customers who were entitled to the guide, not merely casual visitors attracted by free admission to the show.

A number of companies choose DATA '83 to launch their latest products. Perhaps most noticeable was President Office Machines, who distribute the Kaypro and Columbia PC systems. President exhibited two new additions to their range, the Franklin Ace systems and a prototype of the "Magnum 256", a portable 16 bit computer which comes with 256K of battery-backed memory and eight line by 80 character LCD display in a unit the size of a slim attache case. The unit will run for 40 hours on its built-in batteries.

The Magnum is based on the Intel 80286 microprocessor, an up-graded version of the 16-bit 8086. Apart from its compact portability the system also provides two RS232C serial ports, a parallel printer port and a composite video output for connection of a video monitor, The optional video monitor plugs straight in and provides an 80 column by 25 line text display.

At less than $2000 for perhaps the most innovative new computer of 1983 President are definitely on a winner with the Magnum, although production models of the machine will not be available until later this year.

The Eagle 1600, distributed in Australia by Scomo Pty Ltd, was introduced at the DATA '83 exhibition. Features include an 8MHz 8086 processor and 10MB hard disk.

Currently available are two models of the Franklin Ace computer. The Ace 1000 is an Apple "work-alike" manufactured in the United States. Apple Computer tried to stop the distribution of the Franklin but lost the case on the ground that no Apple patents or copyright had been infringed by the design.

The Ace 1200, also on display, comes with two built-in disk drives and up to 128K of RAM. It uses two processors, the 6502 and a Z80A, so it can run most Apple software plus programs written under CP/M 2.2. For the money (around $2600), the Franklin Ace 1200 is a powerful and attractive system, with an assured supply of software.

Hyperion Australia were exhibiting a new 8088-based portable computer system, the Hyperion, which is available with the MS-DOS operating system and a range of Microsoft languages.

This system consists of a compact console and detachable low-profile keyboard. Two 14cm minifloppy disk drives are mounted next to an 18cm (diagonal) amber screen monitor in the console, with serial and parallel I/O port connectors at the rear. A 300 baud modem is also built-in, although this uses the Bell 103J standard and is still awaiting approval by Telecom for use in Australia.

At the other end of the scale, Dick Smith Electronics was out in force, showing the Wizzard computer game console and the new VZ-200 computer, a Z80 based system which provides colour graphics and sound and sells for just $199.

These days it's easy to pick the Apple Computer stand at any exhibition. Just look for the biggest crowd. Demonstrations of the Apple Lisa with the assistance of a projection television system, often attracts crowds six-deep. The high resolution "desk top" display, the use of the mouse as a pointer and the simple, intuitive operating procedures make Lisa easy to appreciate, particularly for those who have never used a computer before.

DATA '83 will be open in Melbourne from the 8th-10th November, at the Exposition Centre, Royal Melbourne Showground. It will be well worth a visit by anyone interested in computers.

Software Source to distribute Oasis system

Australian software distributor Software Source Pty Ltd has signed an agreement with Oasis Systems of California for exclusive Australian distribution of a powerful new "electronic dictionary" program, "The Word Plus"

The Word Plus is a series of integrated spelling check and word analysis functions with the ability to find misspelled words in context and suggest similar words and able to actually correct errors as they are found, rather than requiring the user to make the changes. Other features include high speed operation (10,000 words checked in two minutes) and a 45,000 word dictionary, claimed to be the largest available under CP/M. Additional dictionaries can also be added by the user.

The Word Plus also allows the user to produce a list of words used in a piece of text, sorted either in alphabetical order or by frequency of use (a handy feature if you tend to be a repetitive writer).

Sky Systems of Willoughby, NSW, will also be distributing the Oasis Spellbinder word processing and office management system under licence from Software Source.

For further information on Oasis Systems and a wide range of CP/M and PC-DOS software contact Software Source, 344-348 Oxford St, Bondi Junction. Phone (02) 389 6388.

Software for the Microbee from Allsoft

Allsoft Computer Services was formed earlier this year to create and market a range of software for the Microbee computer, and their first product is currently available at various Microbee software dealers.

The first package consists of two programs, BACCS for home accounting and BPLAN for home budget planning and is claimed to be the first comprehensive personal finance software available for the Microbee computer. Recommended retail price is $28.90.

And an Adventure game by Dreamcards

Dreamcards software has announced the release of a new "adventure" program for the 32K Microbee computer.

The "Merlin" game is based on the legend of King Arthur and his sword Excalibur and is claimed to be one of the few adventure games which avoid frustrating tricks to maintain suspense.

Dreamcards claim that tricks such as not revealing the commands of the game and concealing vital clues are "dishonest", and have gone to great lengths to avoid them in "Merlin" even

An economical video display terminal

Paris Radio Electronics has introduced a new low cost terminal, the Sphere CCT-100, for use with computer systems which require an RS-232C terminal. Features of the unit include a low-glare 30cm green phosphor monitor displaying 80 × 24 lines of text, a high-quality detachable keyboard and selectable baud rates from 75 to 19,200 bits per second. In addition to its own extensive range of editing and data transmission functions the CCT-100 also has the ability to emulate three of the most commonly used terminal configurations, the Hazeltine 1500, Lear-Siegler ADM-3A and the ADDS Viewpoint.

Characters are displayed on a 7 × 9 matrix in a 9 × 12-bit character cell for maximum clarity. Upper and lower case text, 15 graphics symbols and 32 control character symbols can be displayed with attributes including blinking, underline, reverse video, and half-intensity.

The keyboard is arranged in a standard teletype configuration with the @ symbol on the 2 key. Typists will be accustomed to finding double quote marks in this position (Shift "2"), but these are placed next to the RETURN key. Capacitive keys are used, with a firm, positive action and an audible keyclick which may be disabled if not required. Four LED indicators on the keyboard display the status of the caps lock key, local/on line mode, block mode and keyboard lock keys.

A separate numeric keypad with its own ENTER key and a row of 16 function keys above the standard keyboard complete the terminal. The function keys include cursor movement, insertion and deletion of characters or complete lines, single key PRINT and SEND functions and a CLEAR/HOME key.

Other features of the CCT-100 include an auxiliary RS-232C port for a printer or the attachment of "slave" terminals and a 20mA current loop interface. DIP switches accessible from the rear panel allow the selection of one of 11 data transmission rates and the format of serial data, emulation mode and reverse video and either 50 or 60Hz screen refresh rate, among other parameters.

Also provided is a sound generator responding to the ASCII BEL (decimal 7) code and a self-test code which is entered when the terminal is first switched on and reports errors in the terminal's RAM, ROM, serial interface and keyboard.

At $799 (plus sales tax) the CCT-100 is in the low end of the terminal market as far as price is concerned. The features provided, the emulation modes available and the quality of the unit definitely put it high on the "value for money" category however.

For further information contact Paris Radio Electronics, PO Box 380, Darlinghurst, NSW, 2010. Phone (02) 344 9111.

Microcomputer News

setting up the game so that it will list its operating commands on request.

The game is played in traditional adventure style but program modules are run in an order generated by software so that the scenery and special locations change from one game to the next. Coupled with excellent combat routines and a wide range of objects and places to be explored this flexibility is claimed to make "Merlin" a fine game for adventurous types.

The game is supplied as a 54-page book containing the program listing in Microworld Basic along with a detailed commentary, instructions for conversion to other Basic dialects and details of how to play. There is even a solution (just one of many possible). The listing costs $35, with a cassette dump of the program an extra $10 – inexpensive when considered in relation to the prices of similar games which don't provide a program listing.

For more information contact Dreamcards, 8 Highland Court, North Eltham, Vic, 3095. "Merlin" is available by postmail order only.

Coke moves faster with TCG terminals

Coca-Cola Bottlers has introduced a portable data entry system to control entry of orders by salesmen and the despatch and delivery of stock. Handheld terminals for the pilot study and programming work were supplied by the TCG company, which distributes both US-made Norand terminals and the Swedish Micronic product.

According to Mr Les Harvey, Data Processing Manager for Coca-Cola Bottlers, Sydney, TCG was selected because it was the only company which could meet the product specifications of Coca-Cola and which had the software development capabilities to enable the terminals to perform as required and on schedule. He was also impressed by the company's enthusiasm and interest in the work, he said.

The portable data entry system allows each sales representative to be equipped with a hand-held terminal which records orders and transmits them to a central computer via an acoustic coupler.

Advantages of the system include faster order time, less errors and more efficient delivery services. The transmission of computer data rather than reading orders out over the phone is also leading to considerable savings in STD charges for country salesmen.

16-bit portable computer with printer option

Radaro Computer Devices has announced the release of the US-built DOT computer system, a portable computer based on the Intel 8088 processor.

The DOT computer includes 128K to 256K of RAM (expandable to 704K with an additional expansion board), graphics with a resolution of 1024 × 254 on a 22cm (diagonal) in-built video monitor, a built-in thermal printer and up to two Sony 9cm "microfloppy" disk drives with a storage capacity of 280K bytes each.

The 90-key keyboard includes a numeric pad and 10 programmable function keys in addition to 59 typewriter style alphanumeric keys. Two RS-232C serial ports and an output for a composite video signal are also provided for communications and the attachment of an external video monitor.

Dimensions of the system are 45 × 37 × 19cm (W × D × H of main unit) with a detachable 42 × 20 × 4cm keyboard. Weight with carrying case is around 13kg.

For further information contact Radaro Computer Devices, 316 Queen St, Melbourne, Vic 3000. Phone (03) 7 6638.

News from the clubs

- A new Super-80 Users Group has started in Perth. Interested readers should contact Garry Black, 19 Bendigo Way, City Beach, WA, 6015, for further information. Phone (09) 385 8813.
- The Motorola Users Group (MUGS 68xx) is interested in computers based on the 6800, 6802 and 6809 microprocessors, particularly those running the FLEX operating system. The group meets monthly, usually in members' homes. For further information contact Clive Allan, 11 Haros St Avenue, Nunawading, Vic. 3131. Phone (03) 878 1298 after business hours.
- The Commodore Users Group (Qld) has changed its postal address. The new address is PO Box 274, Springwood, Qld, 4127. Main interests are the VIC 20 and PET computers and the group meets on the first Tuesday of each month at 130 Petrie St Terrace, Brisbane. For details contact the secretary, John Egan, on (07) 287 2705.
- Mr C. Maloney of Williamstown, Victoria, is interested in starting a computer bulletin board service for users of the System-80 and TRS-80 computers. His idea is to form a computer club which operates over the phone lines via modems. Find out more by ringing (03) 397 6972 or write to "The Computer Exchange", PO Box 164, Wiliamstown, Victoria, 3016.
- The Newcastle Microcomputer Club meets on the second and fourth Monday of each month at 7.30pm in room G12 of the Physics building of the Univesity of Newcastle. The club publishes a monthly newsletter. For further information contact Angus Bliss. (049) 67 2433 during office hours or Tony Nicholson (049) 52 6017 (after hours).
- The Ballarat Computer Users Group has changed its meeting schedule. The group now meets on the first Wednesday of each month at 7.30pm at a venue notified each month by the publicity officer, John Preston, (053) 31 4363.

Jump From Program To Program

WORLD FIRST FOR AUSTRALIA

Previously businessmen have been only able to use microcomputers and CP/M application software in a serial manner. I.E. one program after the other. This limitation has resulted in businessmen being unable to employ microcomputers to their fullest potential in their minute to minute business activities.

In analysing a typical small business it becomes apparent that the majority of businessmen are required to perform many tasks within a variety of disciplines during a typical business day. They are required to swap randomly from function to function at the drop of a hat. At one moment they may be production controllers, the next moment sales persons, the next promotions managers, then the storeman, and the accountant, etc, etc. By the very nature of office life they seldom get to finish one task before they are interrupted by some other more urgent demand for their time. Thus they have to drop tools to deal with the situation before they can return to the original task.

To date, microcomputer systems have been unable to rapidly jump from function to function directly, and in a way that allows direct return to the previous task. AED have solved this problem via a revolutionary new operating system concept referred to as MPS or Multiple Program Selection. At the press of two special keys the current task and its screen are put into suspended animation and saved. The user then via a menu, selects one of nine other tasks which at an earlier time were suspended. This new task complete with its screen image is placed into the computer memory and released from suspension. The whole operation takes only six seconds which is about twenty times faster than conventional microcomputers. When the new task is completed the operator may return instantly to the original or yet another task.

Swapping programs on conventional microcomputers is slow, requires a large number of keystrokes, and normally there is little or no menu prompting. MPS however is extremely fast, requires only three keystrokes, and is completely Menu assisted. Other companies have attempted to provide a similar solution to this problem, e.g. Apple's LISA, however their approach has been to create a suite of application programs that are fully integrated. This approach yields an improvement over more conventional systems though still suffers the problem of slow swap time and only the programs offered by that particular manufacturer are available for the system. Because the AED MPS system is implemented in the operating system, it offers the fundamental advantages of speed and ready availability of suitable application programs. Any of the standard CP/M programs from a vast range of vendors, can be used with the MPS system. MPS is currently only available on the AED UNIVERSE Supercomputer IH which is an extremely expandable, high speed, IEED 696 S100, Dual CPU, 8 and 16 bit microcomputer system.

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For further information about MPS or the UNIVERSE Supercomputer II contact:—

AED

Sydney: AED MICROCOMPUTER PRODUCTS, 130 MILITARY RD, GUILDFORD 2161.
Phone (02) 681-4966. Telex AA70664.

Melbourne: ELSTON MICRO P/L, 53 WAVERLEY RD, EAST MALVERN 3145.
Phone (03) 211-5542. Telex AA30624 ME447.

Microcomputer News

Inca Data Systems has Rank Xerox typewriters

Inca Data Systems has been appointed a distributor of the Rank Xerox range of electronic typewriters. Foremost among the Xerox product range is the new Memorywriter typewriter, designed for use as a letter quality computer printer and using a daisywheel print mechanism designed for Xerox by Diablo.

The Memorywriter offers daisywheel quality printing at 20 characters per second plus all the features of an electronic typewriter, including automatic storage and playback of up to 26 phrases, automatic centring and indentations and bold printing, underlining, and a 250 character memory for easier correction of typing errors. This memory can be expanded to up to 32K bytes, able to store 15-20 pages of text.

Typical uses of the Memorywriter include word processing, interactive printing computer terminals and application as a "store and forward" terminal allowing text editing before transmission to a host computer. The Memorywriter can also take its place as a complete user workstation in an office, with the ability to send and receive messages from similar workstations, perhaps located in branch offices. Needless to say when not required for any of these uses the Memorywriter can function as an electronic typewriter.

For more information contact INCA Data Systems Pty Ltd, PO Box 200, Pymble, NSW 2073. Phone (02) 498 6933.

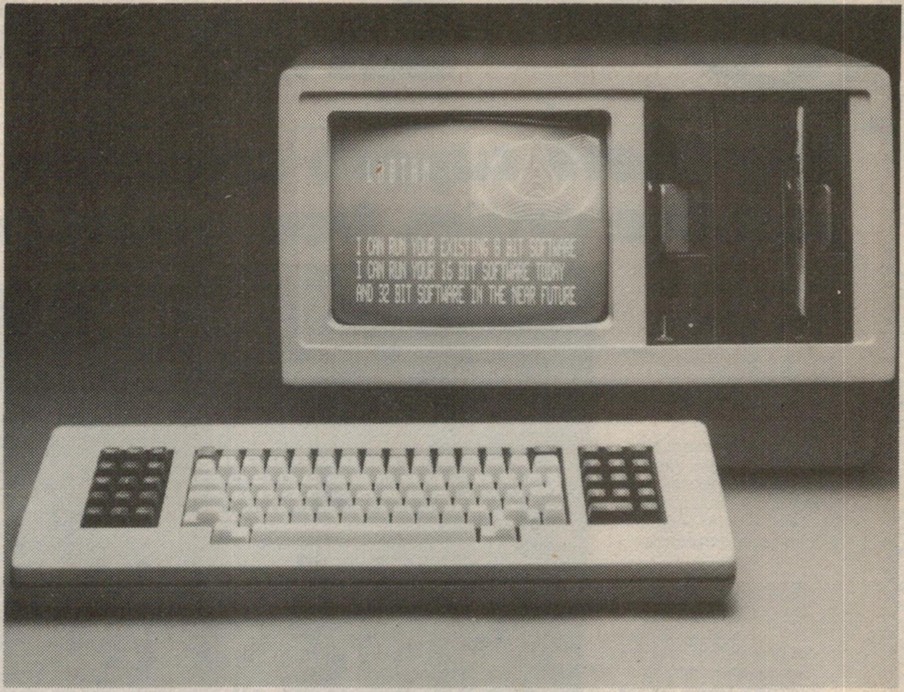
Enhancements for TRS-80 and System-80

"Supa Edit", by eei Pty Ltd is an enhancement to the Edit and List commands of Level II Basic as used by the TRS-80 and System-80 computers including Tandy Model I and Model III machines with 16K, 32K or 48K of memory. A software driver for lower case is included with Mod 1 systems.

Supa Edit provides single key commands to list the first or last line of a Basic program, the ability to step through a listing line by line, either from the start or the end of a program, a listing of the line currently being edited, simple entry into the edit mode for the current line and recovery of programs after a NEW command.

Further information is available from Elite Electronic Industries Pty Ltd, 36 Luxmore St, Cheltenham, Vic 3192. Phone (03) 583 1201.

Advanced Australian-made microcomputer



Labtam International Pty Ltd is a Victorian company which has been involved in the production of sophisticated scientific instruments since 1972. Their most recent product is a 100% Australian-made computer, the Labtam 3000, offering what is claimed to be a unique set of capabilities.

Features of the Labtam series include dual Z80A and 16-bit 8086 microprocessors, two built-in 20cm disk drives or one floppy drive and a Winchester hard disk, and networking and multiuser operation. The system is constructed to the Multibus (IEEE 796) format and includes a Hall-effect keyboard, green phosphor high resolution video display, a shielded cabinet and line transient and RF suppression.

A mathematical processor for hardware floating point operations and a fast Intel 80186 microprocessor are currently available as options and a 68000 add-on board will be available later this year with the Unix operating system.

The Labam 3000 provides an 80 character by 25 line display with programmable characters and high-resolution bit-mapped graphics, including a resolution of 800 × 300 with four intensity levels or 800 × 600 single intensity graphics. Hardware graphics functions include line drawing, rectangle and polygon drawing, area fill and inverse video and the system will also emulate a variety of industry-standard terminals.

System software currently includes CP/M-86 with a CP/M 2.2 emulator, standard with the machine, while the multiuser MP/M operating system is available as an option.

Programming languages available under CP/M-86 include Cobol, Pascal, C, Basic, and Fortran, while the availability of both 8-bit and 16-bit operating systems provides access to a wide range of software including word processing, scientific calculations and simulations, data base management, communications, business and educational applications.

So far the quality construction and reliability of the Labtam series has earned the company 50 orders, 40 of which are from overseas. Purchasers of locally-built equipment of course do not pay the mark-ups demanded by many importers and are assured of local support. Thanks to cost savings provided by local manufacture, the Labtam series can be offered at prices starting at $6000.

For further information contact Labtam International Pty Ltd, PO Box 297, Mordialloc, Vic. 3195. Phone (03) 587 1444.

Wide bandwith video monitor from AED

AED Microcomputer Products has introduced a new video monitor with a 22MHz bandwidth and one-touch tilt and swivel controls. The monitor can be used with any computer system that produces a 1V peak-to-peak video signal and provides good results in an 80 character by 24 line format. The high bandwidth of the monitor also provides creditable performance with 132 character lines.

Inside the unit is space for a 270 × 320mm circuit board and power supply for add-on electronics.

For further information contact AED Microcomputer Products, 130 Military Rd, Guildford, 2161.

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Special self-adhesive 'Playmaster' logo to complete your system: stylish, elegant - and professional!

Fully imported contour grilles that simply press into place on the special grille clips provided. You won't have to worry about grille rattle or movement.

Inside, a fully assembled wiring loom with colour coded push-on connectors. No soldering required: everything is pre-made, ready for you to simply connect together.

Wire-grip cable sockets supplied at no extra cost, for easy connection to any stereo amplifier (speakers are rated at 8 ohms - so will perfectly match your stereo amplifier).

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Huge 300mm bass driver (woofer) with the latest ribbed cone construction. This magnificent speaker handles a massive 55 watts RMS!

Now two new magnificent

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Dick Smith brings you these superbly styled speaker systems to suit your room, your decor ... and your pocket!

Acoustically designed by Neville Williams, MIREE (Aust.), Editor-In-Chief of Electronics Australia magazine, they feature a **completely new format and style,** starting with the strikingly **handsome new grilles** with the **new 'Playmaster' logo** - and ending with a **performance you'd be amazed at!**

You'll **save a fortune** over comparable commercial speakers - because you build them yourself. And all it takes is a couple of hours construction time, a tube of glue and a screwdriver.

They look so good, and sound so great, your friends will never believe you built them!

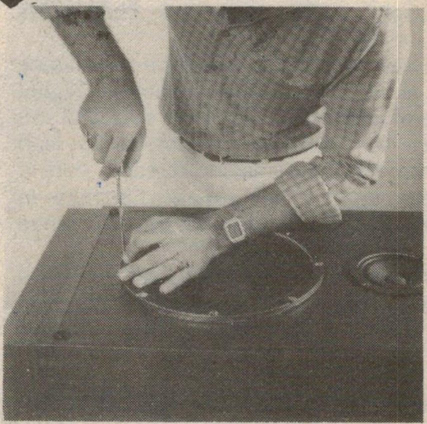
Measured response of Playmaster 300mm speaker system. Compare this performance with speaker systems you'd pay 3 or 4 times as much for.

Measurements performed by Dick Smith Electronics Technical staff

look how easy

The boxes simply fold together - no woodworking knowledge needed. All panels are pre-cut, pre-rebated and pre-drilled. We've even heard of schoolchildren building their own Playmasters: they're that simple!

no special tools needed



What the experts say:

"... the end result represents outstanding value for money. Whether you buy it in kit form or fully assembled, we are sure you will be pleased with sound quality."

"... the new Playmaster 3-70L has generous power handling capacity so that it can give a good account of itself on virtually any type of music."

Neville Williams & Leo Simpson
(Electronics Australia magazine)

All you need is a tube of glue and a screwdriver - everything else is supplied for you. The wiring loom for the speakers is pre-assembled — the connectors just push on. And the speakers drop into position in the holes provided. If you can read simple instructions, you can build your own commercial quality speakers.

Look at these new features:

★All new design in simulated woodgrain finish to complement decor ★Separate level control for high and mid ranges* - tailor the sound to suit your listening environment ★Special speaker sealant material supplied to ensure absolute air tightness ★New design ribbed woofer with massive 30cm cone for accurate bass reproduction ★Built-in plinth to raise speaker off floor level for minimum audio colouration ★Manufactured to the exacting standards of the original design published in Electronics Australia magazine ★Acoustically transparent silk-like grille cloth heat welded to support frame.

*300mm system only

And now you're finished. Settle back with a drink, play your favourite record or tape. The sound quality will make you more than happy and your friends will never believe you built them!

300mm SYSTEM	250mm SYSTEM
Speaker kit, crossovers & faders This kit includes 300mm woofers, high and mid range faders, and 3 way crossover with high power handling capacity. Cat C-2042 ..... **$155.00**	**Speaker kit, and crossovers** This kit includes 250mm woofers and 3 way crossover with medium power handling capacity. Cat C-2044 ..... **$149.00**
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TOTAL SYSTEM ONLY $360 per pair	**TOTAL SYSTEM ONLY $333 per pair**

Note: All prices are per pair.

NOW ONLY $320^10 **NOW ONLY $297^10**

and look at the superb finish

DICK SMITH Electronics

See page 98 for address details

HFC

DSE/A285M/JW

Melbourne distributor for AED Supercomputer

Elston Micro has been appointed as the Melbourne distributor for the AED Universe Supercomputer II. The Universe system is an Australian designed and manufactured computer which offers a choice of 8 or 16 bit single or multi-user operating systems and full S100 bus compatibility. Further details are contained in the review of the system in the March, 1983 issue of Electronics Australia.

Elston Micro has extensive experience in microcomputer-based totaliser equipment and will provide both sales and service for Victorian customers. As Stan Ham, Elston's Managing Director, puts it: "We expect to see a marked increase in sales in Victoria now that the AED range is fully represented here."

For further information contact Elston Micro Pty Ltd, 53 Waverley Rd, East Malvern, Victoria, 3145. Phone (03) 211 5542.

Text and colour graphics for the S-100 bus

Australian company Bisshop Systems has introduced an S-100 video display board which provides both a monochrome 80 × 25 line text display in an eight colour high resolution graphics – simultaneously if required.

The text display is produced on a monochrome monitor designed to accept a composite video signal while the 640 × 200 pixel graphic display requires an RGB colour monitor. A parallel port and encoding circuitry is included for the addition of a keyboard, and a lightpen interface is standard, allowing the board to be used as a stand-alone terminal.

The "Gemini Video Board" (so-called because it generates two displays), has an on-board Z80A processor for executing graphics commands sent from the host processor. All timing and video parameters are generated by a 6545 CRT controller chip so both display formats are completely programmable.

The board has four banks of 16K of video memory, one each for red, green and blue picture components and one for alphanumeric text. Combined with a programmable character generator storing patterns for 256 characters this memory allows a wide range of animation, text displays and graphics formats.

Cost of the board is $680 plus tax and further information is available from Bisshop Systems, PO Box 483, Leichhardt, NSW 2040. Phone (02) 569 3389.

Weekend-on-the-farm computer camps

John and Sylvia Molloy, proprietors of the Morton Park computer camp.

A "Computer Camp" for school children has started operating at Canyonleigh, in the Southern Highlands of NSW.

Morton Park Farm, a property well known to schools for camping and field trips, has turned its shearing shed into a computer classroom. Six Sigma/OKI microcomputers have been installed to ensure that "hands on" experience is given to all campers. Each student over the weekend courses will receive 10 hours of computer time and attend lectures and demonstrations about computers and computer techniques. Several films will also be shown, including the highly rated BBC television computer series.

"We aim to 'open the door' of computing to children . . . to make them aware and enthusiastic about 'computers" says John Molloy, owner of the property. "We won't be letting them play computer games. We will encourage them to create and expand their horizons," he said.

John Molloy believes it's important that children contact the "nitty-gritty" of computers at an early stage. "They will be taught the components of the computer, how they work together, binary and hex codes, standard computer interfaces, how to use cassettes, disks and keyboards, as well as being given an introduction to basic programming."

Without going to great detail, the children who attend the camps will also acquire a little knowledge of the CP/M operating system, with a demonstration of Supercalc and some assembly language programming.

The camps, however, will not be all work, although the schedule sounds exhausting for a weekend. The 18 participants at each camp will also be encouraged to enjoy themselves on the 300 acre farm, which adjoins a national park. The cost of the camp also includes four meals a day.

"We are hoping to attract children from lower income families," says John. "The all up cost is $65 per child. Apart from the weekend program we plan to hold longer weekday courses in computers for children, particularly from less privileged schools."

Book review from p121

The areas covered include serial and parallel data transfers, analog-to-digital and digital-to-analog conversion, biofeedback (measuring muscle responses and heart rate) and control of a video cassette recorder.

Each circuit is fully explained and the accompanying diagrams are clear and easy to read. The software seems to be complete, although considerable knowledge of the Z80 microprocessor is assumed.

Although the circuits as presented are intended for the Model III TRS-80 experienced hobbyists should be able to apply them to any other computer without too many problems thanks to the detailed descriptions provided. In particular, the interface unit for control of a Sony Betamax VCR should answer many questions for interested readers.

In short, an excellent book for "hardware hackers" and anyone interested in putting computers to work.

Our review copy was supplied by McGills Authorised Newsagency, 187 Elizabeth St, Melbourne, Vic, 3000. (P.V.)

50 & 25 YEARS AGO

"Electronics Australia" is one of the longest running technical publications in the world. We started as "Wireless Weekly" in August 1922 and became "Radio and Hobbies in Australia" in April 1939. The title was changed to "Radio, Television and Hobbies" in February 1955 and finally, to "Electronics Australia" in April 1965. Below we feature some items from past issues.

Wireless Weekly 3d

July 1933

Television in England: Mr Bromley Challoner, the English actor who is visiting Australia, is one of the first English artists to have appeared in an English television program. One day the inventor, Mr Baird, came down to the theatre, and asked him if he would act in a sketch for television, and so he obliged with a bedroom sketch.

"Of course," said Mr Challoner, "the transmissions have not yet passed the experimental stage, and the television receivers are so costly that comparatively few people can afford them. Still, the received image, though it is small, is quite clear – you can recognise people – and when they are able to put it on a large screen, it will become most popular. Probably it will make a great difference to the talking-picture business, and even to the theatrical business. Imagine, they will be able to put down a machine in front, say, of a vaudeville show, and broadcast the whole thing!"

☆ ☆ ☆

Radio on world flight: Mr C. T. F. Ulm's giant monoplane, "Faith in Australia", is capable of transmitting on 600 and 900 metres, and also on 34 metres. The 600/900 metre signals will give the plane a range of approximately 300 miles for transmitting and the short wave will give a range of 1500 miles during normal conditions. Where, however, darkness exists between the plane and the receiving station, it is possible that ranges up to 10,000 miles will be worked.

In addition to this equipment, the plane carries an AWA ground set, the weight complete, including batteries, being 19lb, and is so arranged that should the occasion arise, it can be carried quite easily in the event of the aviators having to make a forced march from one point to another.

In the event of the plane descending on the sea, a portable mast, approximately 21ft long, can be erected on the plane's fuselage, in order that the ground set can be used to send out signals.

☆ ☆ ☆

Metal valves: The latest novelty on the English market is the Catkin type of valve. Developed by the Marconi and Osram valve factories, the new valves are of metal construction, no glass pinch-off bulb being fitted. On this account they are claimed to be extremely strong and practically unbreakable.

To demonstrate the stamina of the new valves one enterprising English magazine arranged to have a valve posted from London to Aberdeen and back without any packing whatever. After this strenuous trip the valve was still serviceable.

☆ ☆ ☆

When Hitler was a joke: A German listener caught oscillating deliberately to prevent his neighbours hearing a speech by Little Adolph was sentenced to one month's imprisonment.

Because Little Adolph said so, German manufacturers of radio valves are cutting the price by from 40 to 50% as from July 1. Part of the traders' profits also go into this gift to the dear, dear people, who are now expected to buy more sets to tune into Uncle Adolph with, and learn all about the Vaterland.

RADIO TELEVISION AND HOBBIES

July 1958

Stereo tape: A new plastic tape cartridge announced by RCA may herald a new era for tape in the home. This report shows how seriously domestic stereo is regarded in America.

Stereophonic sound from low-priced magazine-loaded tape, versus stereophonic sound from long playing records appears to be the next major battle to be fought in the home music field.

Stereophonic sound has been available on tape, but a reel has cost between $10 and $20, which is too high. Now the picture has been complicated by the arrival of RCA's new tape magazine. This mounts a ¼in magnetic tape with two spools in a 5 x 7 inch cartridge. The ¼in tape carries four sound tracks instead of two and the player reverses at the end of a tape and plays the other two tracks.

☆ ☆ ☆

Battery operated heart: Preliminary experiments have been made with a small electric motor and pump which could be left permanently inside a person to take over the work of the heart.

The experiments were disclosed by Yale University scientist, Dr B. K. Kusserow, a research Fellow in the Department of Pathology.

Dr Kusserow said the machine was about seven inches long and three-quarter inches round and weighed 3lb.

It consists of a small alternating current motor which gets its power from an outside source.

The wire carrying power to it is the only connection running outside the body.

The pump forces out a jet containing about two teaspoonfuls of blood with each stroke.

The strokes can be adjusted from 40 to 180 per minute.

☆ ☆ ☆

Transistors in space: Future US satellites can continue broadcasting outer space data to earth 1½ to 4 times as long as is presently possible, as a result of the development of a new transmitter by engineers of the DuKane Corp, St Charles, Ill, under contract to the US Naval Research Laboratory.

The transmitter was developed as a 500 milliwatt version of NRL's 100mW satellite transmitter.

The crystal-controlled transmitter employs three recently developed Western Electric transistors capable of operating as oscillators or amplifiers at 108MHz. A comparable tube transmitter requires five times the battery power needed by the transistor version.

The tiny "broadcasting station" weighs less than three ounces and occupies less than 6 cubic inches of space (a cigarette package occupies about 7 cu in).

INFORMATION CENTRE

CAR COMPUTER CAPACITORS: In your article on the Car Computer, I notice that you specify the use of monolithic 0.1μF capacitors and the other types are polyester or ceramic. Could you please advise why monolithics were specified and how they differ from the other varieties. Also are they interchangeable with greencaps etc? What characteristics do they have which make them more suitable for this application?

I have had trouble purchasing these components in this area. In fact when I ask for them I am usually rewarded with a blank stare. Hoping you will be able to clear up my confusion. (R.B., Newborough, Vic.)

● Apart from the capacitance value, capacitors are specified and rated according to many parameters. The most common of these are: change in capacitance with temperature and age, leakage, inductance, physical size and voltage rating.

With the Car Computer, monolithics were chosen for their small size and low inductance. The low inductance means that the capacitor can respond quickly to transients on the supply line of the Car Computer and effectively shunt them to ground. Of course, standard ceramic capacitors are also suitable for this application but they tend to be physically larger than the monolithics which are also a ceramic type.

Greencaps, which are correctly called metallised polyester, are not so effective for transient suppression because of their poorer high frequency response. They are, however, a good general-purpose capacitor for uncritical usage.

PLAYMASTER AM/FM STEREO TUNER: I would much appreciate it if you can solve my problem with the Playmaster AM/FM Tuner which you described in 1978. On applying power there is no display at all. I thought the reason lay in the transformer (no secondary voltages) that I wrecked, not knowing that the solder lugs would not survive bending. The new transformer is now supplying power. Your trouble-shooting notes don't deal with this failure. I have enclosed a table of voltage readings. (L.M., Warburton, Vic.)

● The first point to check with the counter board is to make sure that Q1 to Q4 are, in fact, BC328 or 327 and that they are connected correctly into circuit. Similar checks should be made on Q5 to Q12.

Unfortunately, it is not always possible to diagnose circuit operation from DC voltages taken from a circuit which has digital signals present.

Perhaps the easiest way to check circuit operation is to check with the aid of a portable radio or, for that matter, the AM section of the tuner itself. Tune across the band and listen for the presence of whistles right across the band as you tune. The same whistles can be detected from a calculator which has LED readouts and are due to "multiplex hash".

If you cannot hear it, then it is likely that the AY-3-8112 is defective, or at the very least, the inbuilt crystal oscillator associated with pins 7 & 8, is not working. If this oscillator is not running then multiplex operation of the display will not occur. However, even if the oscillator was not working at least one digit of the display should be alight. The fact that it is not points to a dud chip.

We assume that you have closely checked the board for solder splashes, cold joints and breaks in tracks.

TRANSISTORISED IGNITION: I refer to the April issue of "Electronics Australia" and in particular my letter on transistorised ignition and your answer.

I mentioned that a TAI placed in a Laser had failed. Just to prove the point the replacement failed not long after writing the letter to your journal. This time it was the PUT again and I almost gave up the idea of using transistorised ignition. However, your clue re the zener protecting the PUT plus the revised circuitry published in the intervening period (EA, February 1983) gave me the incentive to press on with the idea. The repaired and amended TAI has now been in operation for a couple of weeks now and I have covered around 300km without trouble. The Laser is now a sweet running vehicle!

However, if one has one's car serviced by the dealer one does not save on the expense of new points as they (the service staff) still replace the points. In connection with this the "lads" seem to misconstrue optimum and maximum when it comes to dwell angle. When the car had its most recent failure (fortunately not in traffic) I changed over to Kettering and barely staggered home where on investigation I found that the points gap was for all practical purposes zero! I don't know whether no points gap gave rise to voltage spikes but the coincidence is there! (G.S., Yarralumla, NSW).

● Thanks for the feedback. The problem is most likely due to power supply

Infrared TV sound control problems

INFRARED REMOTE CONTROL: I have constructed the Infrared TV Sound Control in the version as described in the February 1983 issue. On testing the unit I find that, with the boards connected as described in the article, a voltmeter connected to the output reads 4.2V. Successive operations of the Up button gives progressive readings as follows: 5.6V, 6.5V, 7.2V and 9.4V. Upon reaching this figure, operating the Down button does not have any affect.

Switching off the power and restoring same resets the voltage to 4.2V, whereupon operation of the Down button raises the voltage in exactly the same steps as does the Up button. Neither button, if held depressed, will glide the voltage from 4.2V to 9.4V. Nothing I have tried will decrease the voltage below 4.2V.

Suspecting the transmitter, I checked the board and changed the ICs to no avail. All ICs are mounted in sockets and all have voltage applied. The ABC lines for IC2 on the receiver board appear to be continuous.

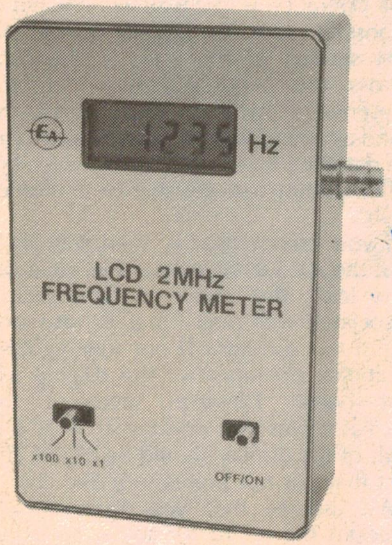
I trust that you can help me with the above problem and suggest a probable cure. (T.C., Mentone, Vic.)

● We suspect a common fault in the Up and Down sections of the transmitter circuitry. The clue lies in the fact that neither the Up button nor the Down button will provide successive clocking of the receiver when held down.

Check the polarity of the diodes at pins 3 and 11 of IC1a and IC1b respectively. If these are reversed, the Up and Down pulses would both be about 0.5s in duration. The receiver would then "see" only Up pulses, regardless of which button was pressed.

Next month in EA . . .

2MHz digital frequency meter



Based on the event counter featured this month, this 2MHz digital frequency meter has a 4½-digit LCD display and a compact pre-scaler module which provides three measurement ranges. It should prove very attractive to the hobbyist, with many uses around the workshop.

Video amplifier for computers

Many hobbyists have attempted to use converted TV receivers as video monitors, with disappointing results. This handy video amplifier allows you to adjust the output level and polarity of the video signal to match your monitor. It's compact, easy to build and uses a plugpack power supply.

PLUS: TOUCH LAMP TIMER

*Although these articles have been prepared for publication, circumstances may change the final content. However, we will make every attempt to include the articles featured here.

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This book can help YOU go right along with it:

Electronic equipment now plays an important role in almost every field of human endeavour. And every day, more and more electronic equipment is "going digital". Even professional engineers and technicians find it hard to keep pace. In order to understand new developments, you need a good grounding in basic digital concepts, and An Introduction to Digital Electronics can give you that grounding. Tens of thousands of people — engineers, technicians, students and hobbyists — have used the previous editions of this book to find out what the digital revolutions is all about. The fourth edition has been updated and expanded, to make it of even greater value.

Here are the chapter headings:

1. Signals, circuits and logic
2. Basic logic elements
3. Logic circuit "families"
4. Logic convention and laws
5. Logic design: theory
6. Logic design: practice
7. Numbers, data & codes
8. The flipflop family
9. Flipflops in registers
10. Flipflops in counters
11. Encoding and decoding
12. Basic readout devices
13. Multiplexing
14. Binary arithmetic
15. Arithmetic circuits
16. Timing & Control
17. Memory: RAMs
18. ROMs & PROMs
19. CCd's & magnetic bubbles
20. D-to-A converters
21. A-to-D converters

Glossary of terms

Available from "Electronics Australia", 57 Regent St, Chippendale. **PRICE $4.50** OR by mail order from "Electronics Australia", PO Box 163, Chippendale 2008. **PRICE $5.40.**

transients. Readers who encounter a similar problem with the PUT should also install a 24V 3W zener across the TAI supply rails.

ELECTRIC FENCE: I recently purchased a kit to make up the electric fence energiser as published in the September 1982 edition of "Electronics Australia". My son, a Telecom Technical Officer, (I belong more in the steam driven radio era) assembled it. The unit seems to have far too rapid a pulse rate, I would estimate three or four per second, and although we can get a small spark across the output and it has an uncomfortable "bite", it does not register on my "Thunderbird" electric fence voltmeter.

Can you suggest any possible remedies? Incidentally, we have tried a couple of coils, including the one from my car which is functioning quite well. (K.R., Glenlyon, Vic.)

● The rate of discharge is determined by the 10MΩ resistor and 0.22μF capacitor connected to the anode of the PUT. Increasing either of these values will give a slower discharge rate. However, a resistor of more than 10MΩ may lead to unreliable operation so it is preferable to change the capacitor.

Decreasing the discharge rate will also allow a bigger charge to build up and thereby lead to stronger pulse. A one second discharge rate is probably optimum and SAA regulations prohibit a rate any faster than 0.75s.

CAR COMPUTER: I built your Car Computer from a kit supplied from Altronics in Perth. Everything works OK except that the flashing colon is blinking at almost twice a second and the minute advances after 36 seconds (by stop watch), giving me incorrect readings on time and km/h. The only incorrect part supplied is the crystal which is marked 3.579545. I have checked the unit out and cannot find any fault. Could you please help? (W.G., Bathurst, NSW.)

● The crystal supplied is the correct type and the fast counting problem fault lies elsewhere in the circuit. Two hardware problems could be the cause.

First, the display scan rate may be far too slow as evident by a flickering display. Check the components at IC5a and for a faster rate decrease the 100kΩ resistor or .01μF capacitor. The second fault could be with the flip flop IC4b. Perhaps the PR or CLR inputs are open circuit or the clock input is faulty. Check the IC for the power supply voltages and correct clocking and data input.

If these problems are not evident, then the fault possibly is in the software. Check the memory location 66DC which should read 0F. This is the count for 15 pulses per second from IC7. An EPROM programmer will be needed to read the EPROM location.

Electronics Australia Reader Service

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REMITTANCES: Must be negotiable in Australia and made payable to "Electronics Australia". Where the exact charge may be in doubt, we recommend submitting an open cheque endorsed with a suitable limitation.

ADDRESS: All requests to the Assistant Editor, "Electronics Australia", Box 163, Chippendale, 2008.

60Hz CLOCK DRIVER: I have a rather unusual request to make for some sort of a clock driver circuit. I have obtained a six-clock panel to display international times for a friend of mine in Abu Dhabi. Unfortunately, the clocks use synchronous motors which require a 220VAC 60Hz supply. Can you suggest a circuit which would provide this? (C.T., Redfern, NSW).

● Our 40W inverter described in May 1982 could be adapted to this task. While we specified a type MM5369EYRN timebase divider IC to derive a 50Hz output from the 3.579MHz crystal, substitution of the MM5369A device will give a 60Hz output.

THEREMIN: I have just recently constructed the Theremin project (June '82). I am having considerable problems with the volume control oscillator. I couldn't obtain the 5-90 pF trimmers required by your circuit, so I've had to settle for second best in the form of 5-60pF trimmers. I've also used a number of old components in the circuit eg, a metal-cased BC107 instead of the BC547 in use these days.

All the resistors in are within the 5% tolerance except for the 33kΩ resistor which I measured as 36kΩ. All the capacitors and coils are new and so should be within the necessary tolerance.

I connected a multimeter between the collector of Q5 and the earth and adjusted the trimmer so that Q5 was biased off when the hand was furthest away from the volume plate and biased on when the hand was close to the plate. The main trouble was that the stage oscillated in the audio range during the transition stage, going from a higher frequency of about 500Hz down to below the audio range (I checked this on a CRO). This frequency is then transmitted through the op amp to the speaker. It's a big pity, as otherwise the rest of the circuit works well. Would you have any comments on the nature of the instability of this oscillator? (R.S. Nedlands, WA.)

● Your problem may be due to incorrect adjustment of the volume control oscillator. The trimmer capacitor should be set such that Q5 is biased off (not on) when the hand is brought near the touch plate. If you cannot adjust the trimmer capacitor to achieve this, you may need to add a small (say 10 or 20pF) capacitance in parallel with it.

Our Theremin worked best with the volume control oscillator operating at 1.9MHz. Since you have access to a CRO, you could check that yours is also operating at about this frequency.

Make sure also that this frequency does not change significantly when you touch the volume plate. If it does, you may need to reduce the coupling between the plate and oscillator.

Notes & Errata

OPTOELECTRONIC TRIGGER (February 1983, File 3/TI/18): Diode D1 is shown reversed on the parts layout diagram. The circuit is correct.

TV CRO ADAPTOR (May 1980, File 7/C/31): On some kits, the range of the horizontal control may be insufficient to enable horizontal locking of the picture. This can be overcome by changing the horizontal control to 47kΩ and, at the same time, increasing the associated 47kΩ resistor to 82kΩ. It may also be necessary to alter the bias around the BC549 to centre the picture. To do this, increase the 10kΩ trimpot to 20kΩ and reduce the associated 180kΩ resistor to 120kΩ.

MARKETPLACE

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Lab Power Supply . . . ctd from p63

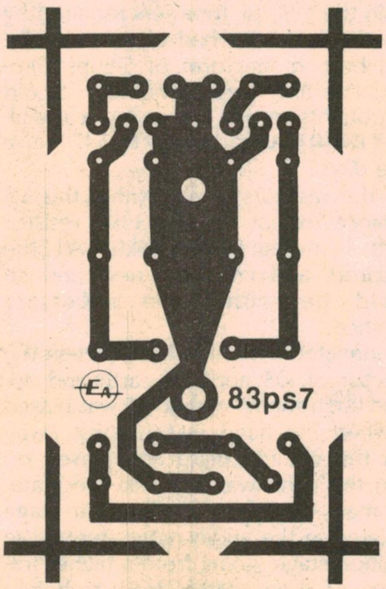
chassis line up. The PCB assembly is now placed in position and the regulators bolted to the chassis using insulating bushes on the mounting bolts. (See regulator mounting diagram for details).

After mounting the regulators use an ohmmeter to check for any short circuit between the tab and the chassis. The PCB is now screwed to the chassis, the mounting screws being selected so that their ends do not touch inside the insulated standoff. For 12mm standoffs the mounting screws can be up to 6mm in length.

The free ends of the PCB connecting wires are now soldered into place as per the wiring diagram and construction is complete.

Addenda

We have been informed by some electronics retailers that there is a shortage of 0.1μF 60V ceramic capacitors in Australia at the moment. We have tested the prototype supply with 0.1μF greencaps and found that they perform just as well as the specified ceramic capacitors. Kits supplied with greencaps instead of ceramics will have the same specifications as the prototype.



Here is the actual size PCB pattern.

Circuit & Design Ideas

A guide for contributors:

If you have a bright idea, handy hint or novel circuit you have developed, why not submit it for publication?

But take care how you submit it. A little attention to the following points should increase your chances of it being printed.

Size: Study the space we allocate for typical articles and use this as a guide. Be concise.

Details: State clearly the problem which inspired the project, and how it is designed to overcome it. Explain how the circuit works, in as much detail as possible. The same applies to mechanical details, if relevant. (We would rather condense this part, than have to work out details ourselves.)

Presentation: Type your copy if possible, with double space between lines. Handwriting is acceptable, but must be legible. Try to follow our style in regard to technical abbreviations, etc.

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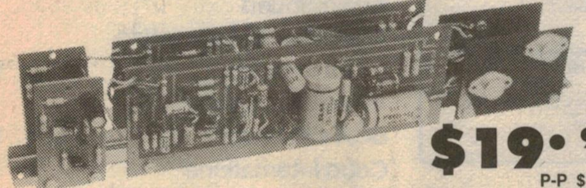

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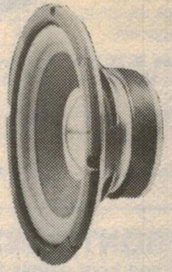

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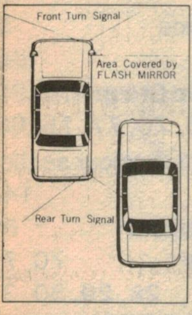

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4310	38cm	Straight surround	8-15 Ohms	45	40-6000	60	$63.00	or	$120.00
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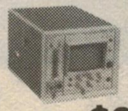

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The binders and magazine holders are available over the counter from Electronics Australia, 57 Regent Street, Sydney, NSW — Price: $5.10 binders, $4.50 holders.

Mail orders should be sent to Electronics Australia, PO Box 163, Chippendale, NSW 2008.

Prices including postage are:

Holders: $5.50 NSW; $5.60 other states: or six for $29.00 NSW; $31.50 other states, $A33.00 NZ.

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EA PC BOARDS AND FRONT PANELS

Some readers have problems obtaining PC boards and front panels for projects. Many of our advertisers sell these items and their advertisements should be checked in the first instance. Failing that, below is a list of firms which produce or sell PC boards and front panels.

NSW
Dick Smith Electronics,
125 York Street,
Sydney, 2000.
Telephone 290 3377.
DSE also has branches and resellers throughout Australia.

Electronic Agencies,
115-117 Parramatta Road,
Concord, 2137.
Telephone 745 3077.

117 York Street,
Sydney 2000.
Telephone 29 2098.

Jaycar Pty Ltd,
125 York Street,
Sydney 2000.
Telephone 264 6688.

Radio Despatch Service,
869 George Street,
Sydney 2000.
Telephone 211 0816.

RCS Radio Pty Ltd,
651 Forest Road,
Bexley, NSW 2207.
Telephone: 587 3491

VIC.
Rod Irving Electronics,
425 High Street,
Northcote, 3070.
Telephone 489 8131.

Kalextronics,
101 Burgundy Street,
Heidelberg 3084.
Telephone 743 1011.

Shop 11,
Regional Shopping Centre,
Melton 3338.
Telephone 743 1011.

Sunbury Printed Circuits,
Lot 14, Factory 3,
MacDougal Road,
Sunbury 3429.
Telephone 744 2714

Altronics,
105 Stirling Street,
Perth 6000.
Telephone 328 1599.

Jemal Products,
8/120 Briggs Street,
Welshpool, 6106.

N.Z.
Marday Services,
PO Box 19 189,
Avondale, Auckland.

Mini Tech Manufacturing Co Ltd,
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Printed Circuits Limited,
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